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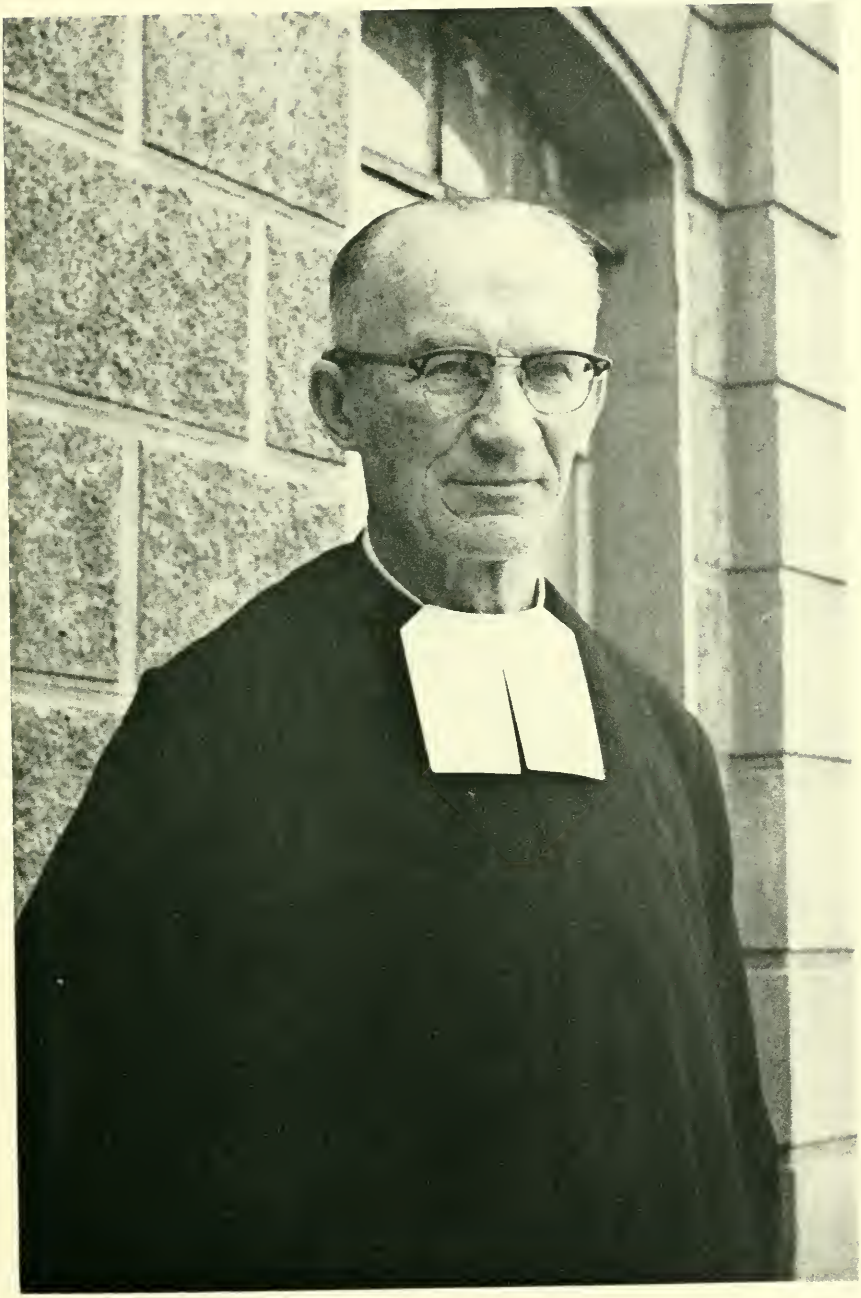

Brother Nicéforo María, director of Museo del Instituto de La Salle, Bogotá, to whom this book is dedicated.

UNITED STATES NATIONAL MUSEUM BULLETIN 288

Frogs of Colombia

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and

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The scientific publications of the United States National Museum include two series, *Proceedings of the United States National Museum* and *United States National Museum Bulletin.*

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This work forms number 288 of the *Bulletin* series.

FRANK A. TAYLOR
Director, United States National Museum

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Dedicated to Brother Nicéforo María, whose pioneering work in Colombian herpetology has cleared a path that makes it easier for those who follow.

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Introduction

This Bulletin had its origin on July 9, 1957, when the following letter was received at the United States National Museum:

Museo del Instituto de La Salle
Bogotá – D.E., Colombia

Dr. Doris M. Cochran
United States National Museum
Washington, D.C.

Madam:

I have before me your important publication "Frogs of Southeastern Brazil" and this prompts me to ask you whether you could accept to identify my collection of Batrachians, especially frogs and toads.

The specimens were collected chiefly along the Amazonian River (Leticia), and near Florencia, Caquetá; Villavicencio, Meta; the Cúcuta region in Norte de Santander, etc.

The material sent for study would be left as a gift for the National Museum, and a tag or label bearing a number would be attached to each of the specimens corresponding to my own list.

I wonder if you can accept my offer and would thank you for a prompt answer.

Please accept my very best wishes for your personal welfare and believe me.

Yours very sincerely,
Brother Nicéforo María
Director of the Museum

Although it was our original intention to report only on the collection in the Museo del Instituto de La Salle, we soon found that there were rather extensive collections available in other institutions and it seemed advisable to bring all of the material together and present a single, comprehensive report.

With one of us working in Washington, D.C., and the other in Gainesville, Florida, it was necessary that we divide the work to some extent. Of the accounts that follow, the ones of the families Pipidae, Ranidae, Pseudidae, Bufonidae, Atelopodidae, and Leptodactylidae were largely prepared by the senior author, those of the families Microhylidae, Hylidae, and Centrolenidae by the junior author. We worked closely throughout the project, however, and we tried to solve all "problems" together; thus, we are jointly responsible for all parts.

The land area of Colombia, comprising 1,136,153 square kilometers, extends from latitude 12°30′ N. to 4°14′ S. and from longitude 66°51′ W. to 79°01′ W.

Several geographic features of Colombia seem to contribute to its immense frog fauna. It is the only South American country directly connected to Central America through the Isthmus of Panama, and the only one that borders upon both oceans. Its northern shores touch on the Caribbean, its western on the Pacific. Reaching as it does from the Amazon River to the Caribbean Sea and from the Orinoco River to the Pacific Ocean, it derives its fauna from many sources.

The western half of Colombia is very rugged. The Andean Chain enters the country from Ecuador as a single range but soon divides into three ranges: the Cordillera Oriental, the Cordillera Central, and the Cordillera Occidental. In the northwest is the isolated Sierra Nevada de Santa Marta. Smaller mountain massifs are the equally isolated Serranía de La Marcarena, in the Orinoco Basin east of the Andes in Meta, and the Serranía de Baudó, which separates the Río Atrato drainage from the Pacific Ocean in northern Chocó and is more or less contiguous with the Serranía del Darién of Panama.

The Cordillera Oriental extends northward in Colombia as the Sierra de Motilones, the Serranía de Valledupar, and Montes de Oca, which, north of latitude 9°05′ North, form the political divide between Colombia and Venezuela. South of latitude 9°05′ North, the Departamento Norte de Santander lies east of these ranges in the Maracaibo Basin. The highest peak in Colombia is the Chúndua or Pico Cristóbal Colón, in the Sierra Nevada de Santa Marta, which reaches an altitude of 5,800 meters. In the three Andean chains, the Nevado del Huila reaches 5,750 meters in the Cordillera Central, the Nevado de Ritacuva 5,493 meters in the Cordillera Oriental, and Cerro Tamaná 4,200 meters in the Cordillera Occidental. In Colombia's southern Andes (before they divide) the Nevada de Cumbal attains a height of 4,764 meters.

Colombia, which during part of the 19th century was known as New Granada, is now divided politically into sixteen "departamentos," five "intendencias," and four "comisarias." These (with their respective areas in square kilometers) are listed below:

Departamentos
- Antioquia (64,370)
- Atlántico (3,288)
- Bolívar (37,632)
- Boyacá (67,928)
- Caldas (13,020)
- Córdoba (23,736)
- Cauca (30,080)
- Cundinamarca (23,444)
- Chocó (46,043)
- Huila (19,786)
- Magdalena (46,317)
- Nariño (32,704)
- Norte de Santander (20,541)
- Santander (30,866)
- Tolima (23,201)
- Valle (21,669)

Intendencias
- Arauca (22,869)
- Caquetá (96,742)
- Guajira (21,094)
- Meta (86,480)
- San Andrés y Providencia (43)

COMISARIAS

Amazonas (120,217)	Vaupés (167,784)
Putumayo (18,061)	Vichada (98,238)

For color descriptions the senior author has used the color names in Robert Ridgway's *A Nomenclature of Colors for Naturalists . . .*, 1886 edition, although the value of such precise naming for old and faded material is often questionable. The junior author uses more popular color names.

The critical measurements are the head-and-body length; head length, from posterior corner of tympanum; head width, between typani; femur, one-half the distance between distal ends of femur when at right angles to body; tibia; foot, from distal base of inner metatarsal tubercle to tip of fourth toe; and hand, from base of thumb to tip of third finger. The senior author records measurements to the nearest half millimeter; the junior author measures in tenths of millimeters. The senior author omits a diagnosis before discussing previously described forms, considering most diagnostic characters to have appeared in the key to the genus; the junior author presents a diagnosis before each description.

Our pleasure in acknowledging the help we have received while working on this project is tempered only by the fear that we have failed to thank some of the many persons who have been so kind to us.

We are deeply indebted to the following for the privilege of examining specimens in their care and for other courtesies: E. Ross Allen, Ross Allen's Reptile Institute; Dr. Walter Auffenberg and Dr. William Riemer, Florida State Museum, University of Florida; M. Boeseman, Rijksmuseum van Natuurlijke Historie; Charles M. Bogert and Dr. Richard Zweifel, American Museum of Natural History; Dr. James Böhlke and Edmond Malnate, Academy of Natural Sciences of Philadelphia; Werner C. A. Bokermann, São Paulo; Dr. William E. Duellman, University of Kansas; Dr. J. Eiselt, Naturhistorisches Museum, Vienna; Dr. José Gallardo, Museo Argentina de Ciencias Naturales; Alice G. C. Grandison and J. C. Battersby, British Museum (Natural History); Dr. Jean Guibé, Muséum National d'Histoire Naturelle, Paris; Dr. Walter Hellmich, Zoologische Staatssammlung, Munich; Dr. Alice Hunter, Universidad de Los Andes, Bogotá; Dr. Robert F. Inger and Hymen Marx, Chicago Natural History Museum; Dr. Alf G. Johnels, Naturhistoriska Riksmuseum, Stockholm; P. Kuenzer, Zoologisches Institute, Göttingen; Dr. Carlos Lehmann, Museo de Historia Natural, Popayán; Dr. Alan E. Leviton, California Academy of Sciences.,

Also, Dr. Bertha Lutz and Dr. Antenor Carvalho, Museu National, Río de Janeiro; Sven Mathiasson, Naturhistoriska Museet, Göteborg; Dr. Robert Mertens and Dr. Konrad Klemmer, Natur-Museum,

Senckenberg; Dr. George S. Myers, Stanford University Natural History Museum; Dr. M. Graham Netting and Neil D. Richmond, Carnegie Museum; Hno. Nicéforo María, Museo del Instituto de La Salle, Bogotá; Dr. Gustavo Orcés V., Escuela Politécnica Nacional, Quito; Dr. James A. Peters,[*] formerly of San Fernando State College and now of the United States National Museum; Dr. Juan Racenis, Museo de Biologia, Universidad Central de Venezuela, Caracas; Dr. Juan A. Rivero, University of Puerto Rico at Mayaguez; Dr. Jay Savage, University of Southern California; Dr. James A. Tamsitt, Universidad de Los Andes, Bogotá; Dr. E. H. Taylor, University of Kansas; Dr. Wilmot A. Thornton, Universidad del Valle, Cali; Dr. Jean Vellard, Museo de Historia Natural "Javier Prado," Lima; Dr. Charles F. Walker, Museum of Zoology, University of Michigan; Dr. Ernest E. Williams, Museum of Comparative Zoology, Cambridge; Dr. Paulo Vanzolini, Departamento de Zoologia, Secretaria da Agricultura, São Paulo; and Mr. George Zug, Museum of Zoology, University of Michigan.,

Dr. Federico Medem made special efforts to collect for us in out-of-the-way places on numerous occasions, often at his own expense. For this we cannot thank him enough. Dr. Gerardo Reichel-Dolmatoff of Bogotá made for us several significant collections for which we are most grateful. Most of the drawings contained herein are the works of Miss Ester Coogle and Mr. Paul Laessle, artists in the Department of Biology, University of Florida, and for these carefully executed figures the artists have our thanks.

Mr. Crawford Jackson, graduate assistant at the University of Florida, contributed materially to this study on more than one occasion, and we are grateful to him. Olive B. Goin spent weeks poring over maps to trace down obscure localities and she also typed much of the earlier drafts of the manuscript. We cannot thank her enough. To our numerous friends in Colombia, whose kindness not only made our visits profitable but made them exceedingly pleasant and enlightening, *nuestros mas sinceros agradecimentos.* The National Science Foundation made it possible for us to visit museums both in this country and abroad, and gave us an opportunity to visit and collect in Colombia. Thus, we are deeply grateful to the National Science Foundation for the following grants: Doris M. Cochran, GB–407 (201D–294), and Coleman J. Goin, G–5628, G–8625, G–13325, and GB–1339.

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[*] The manuscript was in the hands of the editor at the time Dr. Cochran came down with her terminal illness, and since I was in Gainesville, the chore of checking the thousand and one details necessary in a job of this magnitude fell on the shoulders of Dr. Peters at the United States National Museum. I cannot thank him enough for the diligent and careful labor he contributed to the final preparation of this work.—C.J.G

The following abbreviations are used to identify the institutions and individuals owning or having custody of the specimens examined:

AMNH	American Museum of Natural History, New York City
ANSP	Academy of Natural Sciences of Philadelphia
BM	British Museum (Natural History), London
CAS	California Academy of Sciences, San Francisco
CJG	Collection of Coleman J. Goin
CJM	Collection of C. J. Marinkelle, in the Universidad de los Andes, Bogotá
CM	Carnegie Museum, Pittsburgh
CNHM	Chicago Natural History Museum, Chicago
DZSP	Departmento de Zoologia, Secretaria da Agricultura, São Paulo
EK	Collection of Eugene Kramer
EPN	Escuela Politécnica National, Quito
FM	Collection of Federico Medem, in the United States National Museum
IOC	Instituto Oswaldo Cruz, Rio de Janeiro
JAP	Collection of James A. Peters, in the United States National Museum
JP	Museo de Historia Natural, "Javier Prado," Lima
JRT	Collection of James R. Tamsitt
MACN	Museo Argentina de Ciencias Naturales, Buenos Aires
MCZ	Museum of Comparative Zoology, Cambridge
MHNP	Muséum National d'Histoire Naturelle, Paris
MLS	Museo del Instituto de La Salle, Bogotá
MN	Museu National, Rio de Janeiro
MNHUK	Museum of Natural History, University of Kansas, Lawrence
MZUM	Museum of Zoology, University of Michigan, Ann Arbor
NHMW	Naturhistorisches Museum, Vienna
NM	Naturhistoriska Museet, Göteborg
NMS	Natur-Museum Senckenberg [Senckenbergische Naturforschende Gesellschaft], Frankfurt-am-Main
NR	Naturhistoriska Riksmuseum, Stockholm
RNH	Rijkemuseum van Natuurlijke Historie, Leiden
SUNHM	Stanford University Natural History Museum, Palo Alto
UC	Museo de Historia Natural, Universidad del Cauca, Popayán
UCV	Museo de Biología, Universidad Central de Venezuela
UF	University of Florida, Gainesville
UPR	University of Puerto Rico, Mayagüez
USNM	United States National Museum, Washington
UV	Universidad del Valle, Cali
WCAB	Collection of Werner C. A. Bokermann, in São Paulo, Brazil
WTN	Collection of Wilfred T. Neill
ZIMUG	Zoologisches Institut und Museum der Universitat, Göttingen
ZSM	Zoologische Staatssammlung, Munich

Although we here recognize 212 species and subspecies of Colombian frogs, we are not deluded into believing that our list is final in any way. Surely there are a number of undescribed species remaining to be discovered in Colombia, and probably there are dozens of known species that someday will be recorded from that country although they are not known to occur there at the present time.

Thus, we have visualized our task not as one of preparing the final word on the frogs of Colombia but rather as bringing together what is now known and making such knowledge available in a single volume. If this report makes the study of Colombian frogs easier in the future than it has been in the past, then this labor of love is not without value and no further apology is necessary.

Frogs of Colombia

Class AMPHIBIA

Superorder SALIENTIA : Order ANURA

Suborder AGLOSSA

No true tongue present. Vertebrae opisthocoelous. Urostyle fused to sacrum, or articulated to it by a single condyle. Shoulder girdle partly or wholly firmisternal. Ribs free in tadpole, but fused to vertebrae in adult.

Family PIPIDAE

Tips of fingers divided to form star-like sensory structures. Sternum small. Eggs develop in pits in the dorsal skin of the female.

Genus *Pipa* Laurenti

1768. *Pipa* Laurenti, p. 24 (type species, *P. americana* Laurenti=*Rana pipa* Linnaeus).

Generic diagnosis.—Pupil round. Palate smooth. Tynpanum lacking. Fingers free; toes completely webbed. Outer metatarsals separated. Coracoids and precoracoids strongly divergent, the former much dilated and connected by a broad double cartilage, not overlapping. Omosternum rudimentary. Sternum a large cartilaginous plate. Diapophyses of sacral vertebra strongly dilated. Terminal phalanges pointed.

Key to Colombian Species of *Pipa*

*a*¹ No inner metatarsal tubercle; no lateral flaps at angle of mouth; heel reaching between eye and tip of snout; brown horny tips on the first three toes; size to 45.5 mm. . . . . **P. parva**

*a*² An inner metatarsal tubercle present; lateral flaps at angle of mouth present; heel reaching to axilla; no horny tips on any of the toes.

  *b*¹ Body subcylindrical and rounded; many short, tentacle-like skin structures near mouth and on throat, but no large flap-like appendages at tip of snout and angle of jaw; size to 88 mm. . . . . **P. snethlageae**

b^2 Body very depressed and flattened; a few short tentacle-like skin structures near mouth and on throat, and larger flap-like appendages on tip of snout and at angle of jaw; size to 200 mm. . . . . **P. pipa**

Pipa parva Ruthven and Gaige

Plate 1a–c

1923. *Pipa parva* Ruthven and Gaige, p. 1 (type locality, Sabana de Mendoza, Venezuela).—Noble, 1925b, pp. 1, 2.—A. Lutz, 1927, pp. 38, 41, 54, 56, pl. 8, fig. 1.—Barbour and Loveridge, 1929, p. 320.—Mello-Leitão, 1937, p. 277.—Dunn, 1948, p. 8.—Nicéforo María, 1958, p. 14, fig. 9.—Ginés, 1959, p. 104.—Rivero, 1961, p. 18.—Gorham, 1963, p. 15.

1937. *Protopipa parva*.—Miranda-Ribeiro, 1937b, p. 26.—Carvalho, 1939b, p. 394, figs. 6b, c.

Description.—USNM 147122, an adult female from Astillero, Norte de Santander, Colombia. Snout long, rounded when viewed from above, greatly depressed in profile and rounded at the tip, the upper jaw extending far beyond the lower. Nostrils slit-like, terminal, slightly projecting. Canthus rostralis not distinguishable from loreal region, which gradually descends to upper lip. Eye very small, projecting, its diameter about one-third its distance from tip of snout; interorbital diameter about 1⅓ times the snout length; upper eyelid not developed; interval between nostrils about 2½ times the snout length. Tympanum not visible. Fingers long, tapering, each with a 4-pointed "star" at the tip, slightly webbed, nearly equal in length, the second slightly longer than the third, their order from shortest to longest being 4, 1, 3, 2; no thumb pad, palmar callus, or metacarpal tubercles present. Toes long and slender, fully webbed, with pointed tips, their order of length being 1, 2, 5, 4, 3; no inner or outer metatarsal tubercles; no tarsal ridge; no skinfold on heel, a slight one at knee. Body very stout, in postaxillary region more than 1½ times the greatest width of head. When hind leg is adpressed, heel reaches anterior insertion of shoulder; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts with small, regular tubercles surrounded by minute pustules, the tubercles becoming elongate and tipped with small spines on the limbs; venter minutely granular, with a few transverse glandular lines; chin without granules, but with curving glandular ridges; no lateral skinfolds at angle of mouth; a row of glandular ridges from posterior corner of eye to shoulder and along the sides; a heavy glandular lateral fold from behind axilla to groin; no skinfold across the chest; no true ventral disk. This female has the skin on the back greatly distended by eggs.

Dimensions.—Head and body, 45.5 mm.; head length, 9.5 mm.; head width, 11 mm.; femur, 18.5 mm.; tibia, 19 mm.; foot, 19.5 mm.; hand, 8 mm.

Color in alcohol.—Dorsal skin uniform olive, the tips of the tubercles and the webs between the toes wood brown; venter dull cinnamon to wood brown, immaculate; edges of lips drab; some drab mottlings between eye and shoulder below the glandular lines.

Remarks.—This is the smallest species of the genus. The largest individual known is the one described above. Dunn (1948) has given a very adequate discussion of relationships of this group. He notes the occurrence of this species in Río Zulia, north of Cucutá in the Department of Norte de Santander, as well as in Venezuela. Hno. Nicéforo María (1958) has figured and described some specimens from Astillero.

Specimens Examined

COLOMBIA

Norte de Santander: Astillero, MLS 270, 805–9, USNM 147122.

VENEZUELA: 15 km. west of El Mene, USNM 115819–20; Lagunillas, USNM 115757–8; Río San Juan, USNM 115767–9; two km. west of Rosario, USNM 115770–817; Zulia, USNM 128845–6.

Pipa snethlageae Müller

Plate 1g–i

1914. *Pipa snethlageae* L. Müller, 1914a, p. 102 (type locality, Utinga, near Belém, Pará, Brazil); 1914b, p. 507, figs. 1, 2; 1924, p. 293.—Barbour, 1923b, p. 4, pl. 2, fig. 2.—Neiden, 1923, p. 18.—Noble, 1925b, p. 1.—Dunn, 1948, p. 9.—Gorham, 1963, p. 15.—Neill, 1964, p. 275.

1914. *Pipa americana* forma nova(?) Minke, p. 419, pls. 2, 3.

Description—WTN 2561, an adult from Leticia, Amazonas, Colombia. Snout very short, bluntly rounded when viewed from above, declivous in profile, the upper jaw extending somewhat beyond the lower. Tentacles on snout restricted to a few short pointed tubercles, and those at angles of mouth not longer than eye diameter. Nostrils minute, slit-like, not projecting, located on front and near center of snout. Canthus rostralis scarcely apparent, as the whole head is flattened, and slopes out and then down to the upper lip. Eye very small, dorsolateral in position and on front of head, its diameter about one-fourth its distance from tip of snout; interorbital diameter three times the distance between the nostrils; upper eyelid not apparent. Tympanum concealed, indicated only by a deep depression above angle of jaw. Fingers free, their tips with four small sharp projections, without lateral ridges, first shorter than third, second the longest, fourth shortest and reaching to base of penultimate phalanx of third; no thumb pad present, and no palmar callus; metacarpal tubercles poorly developed, very small. Toes pointed, completely webbed, third toe longest, second a little shorter than fifth; a small blunt, oval inner metatarsal tubercle, but no outer one; no tarsal ridge; skin baggy on heel and knee without forming folds. Body very stout, in postaxillary region over 1½ times the greatest width of head. When hind leg is adpressed, heel barely reaches axilla; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are separated. Loose skin of body covers basal parts of legs and arms. Skin of upper parts finely pustular, with scattered glandular tubercles and short glandular ridges above eye and on neck and body; angle of jaw with a small pointed skin projection, but no projection on tip of snout; venter pustular, more coarsely so on posterior abdomen and legs; a heavy glandular ridge above anus and two rounded projections below it; a short, indistinct glandular ridge from posterior corner of eye, ending behind the depression above angle of mouth; no skinfold across chest; no ventral disk; no external vocal sacs.

Dimensions—Head and body, 89 mm.; head length, 20 mm.; head width, 27.5 mm.; femur, 34.5 mm.; tibia, 31 mm.; foot to end of third toe, 35.5 mm.; hand, to end of third finger, 13 mm.

Color in alcohol—Dorsum plumbeous, lightening to drab-gray on the sides and on legs, with small pale spots wherever the skin glands occur; venter very light gray with a dense scattering of darker gray dots, the chin darker, and a few small black spots on center of throat and belly and along front of shoulder and forearm; side of head and body smoke gray, with a slate-gray line from tip of snout below canthus to eye, becoming darker below eye, and lightening and suffusing behind it; a small round drab-gray spot immediately behind eye; tubercles above eye and on sides of neck pearl gray; posterior femur slate-gray with lighter tips on the numerous granules and rows of tubercles there; palms of hands and soles of feet clove brown, the webs between the toes mottled with drab.

Remarks—The example from Leticia, the only specimen examined, agrees well with Müller's description of the type, except that it is larger. More material of this interesting form should be sought in order to estimate its variation, occurrence, and life history.

***Pipa pipa* (Linnaeus)**

PLATE 1D–F

1758. *Rana pipa* Linnaeus, p. 210 (type locality, Surinam).—Gmelin, 1789, p. 1046, no. 1.—Shaw, 1802, p. 167, pls. 50, 51.—Andersson, 1900, p. 20.—Dunn, 1948, p. 9.

1768. *Pipa americana* Laurenti, p. 25 (type locality, Surinam).—Duméril and Bibron, 1841, p. 773, pl. 92, fig. 2.—Wyman, 1854, p. 369, figs. 1–5.—Günther, 1858, p. 3.—Steindachner, 1867, p. 6.—Boulenger, 1882a, p. 459.—Boettger, 1892, p. 51.—Bartlett, 1896, p. 595, figs. 1, 2.—Bancroft, 1897, p. 101, pls. 4, 5.—Brandes and Schoenichen, 1901, p. 404, figs. 5–10.—Gadow, 1901, p. 119, fig. 30.—Baumann, 1912, pp. 111, 164.—Minke, 1914, p. 417.—Beebe, 1919, p. 207; 1925, p. 122.—Ruthven, 1919, p. 14.—Nieden, 1923, p. 17.—Dunn, 1948, p. 9.—Röhl, 1949, p. 395, fig. 177.

1799. *Rana dorsiger* Schneider, p. 121 (type localities, Guiana and Surinam).—Dunn, 1948, p. 9.

1802. *Bufo dorsiger*.—Sonnini and Latreille, 1802, p. 120, fig. 2. of plate facing p. 112 of vol. 2.—Daudin, 1802, p. 85, pl. 31, pl. 32, fig. 2; 1803, p. 172.

1820. *Pipa tedo* Merrem, p. 179 (type locality, Surinam).—Dunn, 1948, p. 9.

1824. *Pipa curucuru* Spix, p. 53, pl. 22, figs. 1, 2 (type localities, Bahia(?) and Amazon River).

1826. *Pipa dorsigera*.—Fitzinger, 1826, p. 65.—Gravenhorst, 1829, p. 70.—Duméril and Bibron, 1841, p. 774.—Ernst, 1877, p. 281.—Brandes and Schoenichen, 1901, p. 423.

1830. *Asterodactylus pipa*.—Wagler, 1830, p. 199.—Schinz, 1833, p. 237, pl. 96, fig. 8.—Tschudi, 1838, p. 90.—Duméril and Bibron, 1841, p. 774.—Brandes and Schoenichen, 1901, p. 423.

1835. *Leptopus asterodactylus* Mayer, p. 34 (substitute for *Pipa americana* Laur.).—Duméril and Bibron, 1841, p. 774.—Dunn, 1948, p. 10.

1836–1849. *Pipa surinamensis* Duvernoy, *in* Cuvier, pl. 39, fig. 2 (substitute for *Rana pipa* Linn.).—Cope, 1870, p. 156.—Sclater, 1895, p. 86.—Dunn, 1948, p. 10.

1836–1849. *Pipa laevis* Duvernoy, *in* Cuvier, p. 155, footnote 2 (type locality, Rio Negro, Brazil).—Dunn, 1948, p. 10.

1841. *Pipa cururuu*.—Duméril and Bibron, p. 774.

1858. *Pipa sedo*.—Schlegel, 1858, p. 59, pl. 4, fig. 78.—Dunn, 1948, p. 10.

1923. *Pipa pernigra* Barbour, 1923b, p. 4, pl. 2, fig. 1 (type locality, Lago Maximo, near Villa Bella, Brazil, between the mouths of Rio Madeira and Rio Tapajoz).—Barbour and Loveridge, 1929, p. 320.—Dunn, 1948, p. 10.

1923. *Pipa pipa*.—Barbour, 1923b, p. 3.—Noble, 1925, p. 1.—Miranda-Ribeiro, 1926, p. 198, pl. 22, figs. 105–110.—Cott, 1926, p. 1159.—Crawford, 1931, p. 28.—Mello-Leitão, 1937, p. 277.—Dunn, 1948, p. 9.—Hno. Nicéforo María, 1958, p. 13.—Ginés, 1959, p. 104.—Goin, 1960b, p. 434.—Rabb, 1960, p. 308, 1 fig.; 1961, p. 95, figs.—Rabb and Rabb, 1960, p. 271, 3 figs.; 1963, p. 636, 1 fig.—Rabb and Snedigar, 1960, p. 40, 1 fig.—Rivero, 1961, p. 17.—Cochran, 1961, p. 49, photographs.—Bokermann, 1962, p. 214.—Gorham, 1963, p. 15.—Neill, 1964, p. 275.

Description.—MLS 810, an adult from Leticia, Amazonas, Colombia. Snout short, flat-sided, making an obtuse angle when viewed from above, pointed in profile, the upper jaw extending considerably beyond the lower. Nostrils small, slightly projecting, lying at tip of snout, narrowly separated. Canthus rostralis not well marked; loreal region narrow, vertical, merging with the very narrow upper lip. Eye extremely small, halfway between angle of jaw and tip of snout, and one-fifth of that distance in diameter; interorbital diameter nine or ten times that of the narrow upper eyelid, and about three times that between nostrils. Tympanum not distinct. Fingers very long and slender, without lateral ridges, free, increasing in length in the order 1–4–2–3, each finger with a tactile 4-pointed "star" at its tip; no thumb pad, palmar callus, or metacarpal tubercles. Toes long, fully webbed, third and fifth toes subequal, the second a little longer than fourth; a sharp, triangular inner metatarsal tubercle, but no outer one, no tarsal ridge; a slight skinfold on heel and knee. Body very stout and flat, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches axilla; when limbs are laid along the sides, knee and elbow are slightly separated; when hind legs are bent at right angles to body, heels are well separated, Skin of upper parts roughened by small spiny tubercles beginning behind head and enlarging posteriorly; a large fringed skinflap at angle of jaw, and a semicircular one above anus; a small tentacle at each nostril, and other tentacles nearly encircling eye; venter finely tubercular, with many short transverse wrinkles on belly; a narrow glandular ridge from eye to corner of mouth; four longitudinal ridges on back and dorsolateral region; no skinfold across chest; no ventral disk; no vocal sacs in the male.

Dimensions.—USNM 57571, a female from British Guiana: head and body, 134 mm.; head length from angle of jaw, 40 mm.; head width, 54 mm.; femur, 58.5 mm.; tibia, 53.5 mm.; foot, 50 mm.; hand, 35 mm.

Color in alcohol.—Above dull olive, immaculate; sides and venter with dirty whitish spots. A young specimen (USNM 142178) from Río Urubu near Itacoatiari, Brazil, is ochraceous above and below, with small sepia spots along the dorsal ridges and scattered over venter, with a transverse sepia line across the throat and a wider midventral stripe from throat to anus.

Remarks.—While Leticia, in Amazonas, is at present the only known Colombian locality for *Pipa pipa*, it seems likely that the species also will be found in headwaters of other affluents of the Amazon River system.

Specimens Examined

COLOMBIA
  Amazonas: Leticia, MLS 810.
BRAZIL: Rio Urubu, near Itacoatiari, USNM 142178.
BRITISH GUIANA: USNM 57571.

SUBORDER DIPLASIOCOELA

Shoulder girdle usually firmisternal. Epicoracoids sometimes more or less separated, but never produced into posteriorly directed epicoracoid horns. Vertebral column either diplasiocoelous or uniformly procoelous. Sacral vertebra usually articulated with urostyle by a double condyle. Ribs never present.

Family Ranidae

Sacral diapophyses cylindrical or very slightly dilated. No intercalary cartilage between penultimate and last digital phalanx.

Subfamily Dendrobatinae

Vertebral column uniformly procoelous. Shoulder girdle firmisternal. Omosternum frequently bony. A pair of glandulomuscular organs present on top of each terminal digit. Skin usually smooth or faintly granular. In *Dendrobates*, the sacral and presacral vertebrae are fused.

Key to Colombian Genera of Dendrobatinae

a.^{1} No maxillary teeth present . . . . **Dendrobates**
a.^{2} More or less well-developed teeth on maxilla . . . . **Phyllobates**

Genus *Dendrobates* Wagler

1830. *Dendrobates* Wagler, p. 202 (type species, *D. tinctorius* Wagler).

Generic diagnosis.—Pupil horizontal. Tongue elongate, entire, free behind. Tympanum more or less distinct. Fingers and toes free, their tips dilated into disks subdivided above. Outer metatarsals united. Omosternum a weak, semi-ossified style; sternum cartilaginous. Terminal phalanges T-shaped. Maxillary and vomerine teeth absent.

Key to Colombian Species of *Dendrobates*

a^1. First finger nearly as long as second, or longer.
  b^1. First finger longer than second.
    c^1. Heel reaching a point between anterior corner of eye and nostril; size to 46 mm. . . . . **D. trivittatus**
    c^2. Heel reaching posterior corner of eye; size to 27.5 mm. . . . **D. ingeri**
  b^2. First finger nearly as long as second; heel reaching to center of eye.
    c^1. A pale axillary spot; dorsolateral lines fine and sharp; reticulations on posterior half of belly only; size to 23 mm.. . . . . **D. hahneli**
    c^2. No pale axillary spot; dorsolateral stripes relatively wide; venter with light spots or reticulations evenly distributed; size to 34.5 mm. **D. lugubris**
a.^{2} First finger much shorter than second.
  b^1. Size small, not over 18 mm.; a diagonal gland halfway between heel and inner metatarsal tubercle.
    c^1. A large white spot on underside of upper arm from axilla nearly to elbow.
      d^1. Heel reaching to anterior border of eye; no definite dorsal stripes; size to 18 mm.. . . . . **D. opisthomelas**

d^2. Heel reaching to posterior border of eye; usually a wide light middorsal stripe and a pair of dorsolateral stripes; size to 16.5 mm. **D. minutus ventrimaculatus**

c^2. No conspicuous light spot below upper arm; size to 17.5 mm. **D. minutus minutus**

b^2. Size medium, up to 38 mm.

c^1. Dorsum black with large or small light spots.

d^1. Many small white spots evenly scattered on back; size to 37.5 mm. **D. tinctorius wittei**

d^2. Usually a large white spot on snout and another between shoulders; size to 38 mm. . . . . **D. tinctorius histrionicus**

c^2. Dorsum not black.

d^1. Dorsum pale, usually with large dark irregular spots; size to 35.5 mm. **D. tinctorius chocoensis**

d^2. Dorsum olive-gray with many irregular small black spots (in alcohol; said to be scarlet in life); size to 32 mm. . . . **D. tinctorius confluens**

Dendrobates trivittatus (Spix)

Plate 5g–i

1824. *Hyla trivittata* Spix, p. 35, pl. 9, fig. 1 (type locality, Teffé River, Brazil).—Tschudi, 1838, p. 71.

1824. *Hyla nigerrima* Spix, p. 36, pl. 9, fig. 2 (type locality, Ecgá, Amazonas, Brazil).—Lutz and Kloss, 1952b, p. 669.

1825. *Hyla bivittata* (lapsus for *trivittata*).—Boie (in Wied-Neuweid), 1825, p. 363.

1830. *Dendrobates trivittatus*.—Wagler, 1830, p. 202.—Peters, 1873a, p. 213.—Cope, 1874b, p. 129; 1885, pp. 94, 96.—Boulenger, 1882a, p. 144; 1884, p. 636; 1888d, p. 455.—Kappler, 1885, p. 858.—Gadow, 1901, p. 273.—Brandes and Schoenichen, 1901, p. 404.—Lidth, 1904, p. 92.—Andersson, 1906, p. 2; 1945, p. 4.—Baumann, 1912, p. 161.—Fowler, 1913, p. 164.—Beebe, 1919, p. 210.—Miranda-Ribeiro, 1926, p. 181, fig. 98.—Ahl, 1929, p. 148.—De Witte, 1930, p. 230.—Crawford, 1931, p. 37.—Crawford and Jones, 1933, p. 91.—Mello Leitão, 1937, p. 292.—Parker, 1939, p. 87.—Laurent, 1942, p. 8, figs. 7–12.—Schmidt and Inger, 1951, p. 448.—Lutz and Kloss, 1952, p. 665.—Cochran, 1961, p. 112, photograph.—Gorham, 1963, p. 25.

1830. *Dendrobates nigerrimus*.—Wagler, 1830, p. 202.—Fitzinger, 1843, p. 32.—Steindachner, 1864, p. 257, pl. 13, figs. 2, 2a–d.

1841. *Dendrobates obscurus* Duméril and Bibron, p. 655 (type locality unknown).—Guichenot, 1855, p. 87, pl. 18, fig. 2.—Lutz and Kloss, 1952, p. 669.

1958. *Dendrobates pictus* (not of Duméril and Bibron).—Goin and Layne, 1958, p. 102, photograph.

Description.—USNM 146832, an adult female from Puerto Nariño, Amazonas, Colombia. Tongue half as wide as mouth opening, ovate, its posterior border free and unnotched; snout very broadly rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis distinct, slightly rounded; loreal region flat, vertical, in line with upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum distinct anteriorly, its greatest diameter about three-fifths that of eye, separated from eye by an interval equal to about one-eighth its own diameter; a swollen area behind tympanum partly obscuring its upper posterior border. Fingers rather long, with moderate disks and heavy lateral ridges, free, first finger longer than second or fourth, its tip reaching almost midway on penultimate phalanx of third, the disk of which covers a little less than one-fourth the tympanum; a very small round thumb pad present; a large palmar callus; metacarpal tubercles well developed. Toes long, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; disk of fourth toe covering less than one-fourth the tympanum, and equal to that of third finger; a small oval inner metatarsal tubercle, and a smaller round outer one; a tarsal ridge ending in a diagonal bar and enlarged tubercle about two-thirds the distance from inner metatarsal tubercle to heel; a pronounced skinfold on heel and knee. Body elongate, slender; in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril, and tarsometatarsal articulation reaches far beyond snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts granular, less so on snout and just above dorsolateral stripes; venter with very indistinct granules and more distinct transverse glands across belly; throat and sides nearly smooth; posterior femur and post-anal region granular; no glandular ridge behind eye; a skinfold across the chest; a slight ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 43.5 mm.; head length, 13.5 mm.; head width, 12 mm.; femur, 17.5 mm.; tibia, 20.5 mm.; foot, 17.5 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum blackish slate; snout and anterior third of eyelids gray; a narrow gray dorsolateral stripe running back from head, passing above tympanum, and continuing to groin; venter and sides blackish slate, unspotted; side of head slate, with a paler border along upper lip; palms of hands and soles of feet olive-gray, their tubercles and disks pale drab-gray.

Remarks.—This frog is one of the most readily recognized of the Colombian *Dendrobates* because the first finger is longer than the second—a reversal of finger-length relationships found in other Colombian species except *ingeri*. Its back is granular, and the dark slate color of its entire body when preserved contrasts with the pronounced patterns of the *tinctorius* group of *Dendrobates*. Sometimes, however, the wide dorsolateral stripe appears as a lighter gray.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, UF 8535; Puerto Nariño, USNM 146832.

PUTUMAYO: Río Aquiles on the Río Mecaya, a tributary of the upper Río Caquetá, USNM 144992–3.

BRAZIL: "Lower Amazonia," USNM 28931; Marajo Island, Pará, MCZ 15663.

BRITISH GUIANA: Paruima Mission, Kamarang River, USNM 118681–2.

ECUADOR: Junction of the Chiguancay and Chanchan Rivers, ANSP 18188.

PERU: Between Pucallpa and Río Aquaytra, MCZ 24443; Tingo María, CAS 85152; vicinity of Puerto Santa Clara, Orellana, USNM 127214–8.

***Dendrobates ingeri*, new species**

PLATE 2D–F

Holotype.—USNM 146846, an adult from Aserrío, near Río Pescado, Caquetá, Colombia, collected by Hno. Nicéforo María.

Paratypes.—USNM 146847–9, same data as holotype.

Diagnosis.—First finger longer than second; adpressed heel reaching to posterior corner of eye; no dorsolateral light lines; venter anteriorly slate-black, posteriorly with faint light reticulations; size to 27.5 mm.

Description of holotype.—Tongue relatively large, half as wide as mouth opening, pyriform, its posterior border free and unnotched; snout bluntly rounded when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, projecting, their distance from end of snout one-third their distance from eye. Canthus rostralis distinct, rounded; loreal region slightly concave, vertical, continuous with the upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital diameter equal to that of upper eyelid, considerably narrower than interval between nostrils, Tympanum distinct but rather small, its greatest diameter one-third that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers long, with rather small disks and slight lateral ridges, free, first finger longer than second or fourth, its tip reaching to base of penultimate phalanx of third, the disk of which covers about one-eight the tympanum; a small oval thumb pad present; a larger round palmar callus; metacarpal tubercles well developed. Toes long, very slightly webbed at the base, third toe much longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering one-fourth the tympanum and appreciably larger than that of third finger; a small oval inner metatarsal tubercle, and a round outer one of about the same size; a weak tarsal ridge, with a small round tubercle midway to heel; a distinct skinfold on heel and knee. Body elongate, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts coarsely granular except on snout, which is nearly smooth; venter smooth (pustular under the lens), with a few fine, irregular glandular lines near the sides; a slight swelling behind eye, and a wide glandular ridge from posterior corner of eye descending behind tympanum and ending above shoulder; no skinfold across the chest; no ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 27.5 mm.; head length, 8 mm.; head width, 8.5 mm.; femur, 11 mm.; tibia, 12 mm.; foot, 10 mm.; hand, 7.5 mm.

Color in alcohol.—Dorsum slate-black, a little lighter on top of head, and with traces of a gray chevron mark in front of eyes; a small pearl gray spot on upper proximal femur behind groin; a small round light spot in axilla, continued on upper proximal surface of upper arm; venter slate-black, with very indistinct indications of a coarse light reticulation on belly, and a light stripe around edge of lower jaw; posterior femur slate-black, unspotted; side of head slate-black, the area along the upper jaw mouse gray; palms of hands and soles of feet slate color, their tubercles and disks drab-gray.

Remarks.—This new species apparently is allied to *Dendrobates hahneli*, but it lacks the dorso-lateral light lines, while its first finger is clearly longer than the second, and its adult size is larger, up to 27.5 millimeters. Although the possession of the long first finger places *D. ingeri* with *D. trivittatus* in the key, the two are not closely related. The new species has a much shorter hind leg and grows only half as large.

Dendrobates hahneli Boulenger

PLATE 5D–F

1884. *Dendrobates hahneli* Boulenger, 1884a, p. 636, pl. 57, fig. 4 (type locality, Yurimaguas, Huallaga River, northern Peru); 1886, p. 412.
1952. *Dendrobates p(ictus) hahneli.*—B. Lutz, 1952, pp. 601, 613, figs. 3, 4.

Description.—USNM 144965, an adult from the Macarena, on the upper Güejar and El Mico, Meta, Colombia. Tongue half as wide as mouth opening, ovate, its posterior border free and unnotched; snout truncate when viewed from above, slightly convex and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils inferolateral, projecting, their distance from end of snout about one-quarter their distance from eye. Canthus rostralis distinct; loreal region flat, vertical, merging with the vertical upper lip. Eye large, prominent, its diameter about 1⅓ times its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, greater than interval between nostrils. Tympanum distinct except for its upper posterior edge, its greatest diameter half that of eye, not separated from eye by an appreciable distance. Fingers long, with lateral ridges, free, first finger nearly equal to second, fourth longer than either, its tip reaching to base of penultimate phalanx of third, the disk of which covers about one-eighth the tympanum; a small weak thumb pad present; a more definite round palmar callus; metacarpal tubercles well developed. Toes long, third toe longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering one-eighth the tympanum and approximately equal to that of third finger; a distinct oval inner metatarsal tubercle and a smaller round outer one; a blunt tarsal ridge, ending at heel, with a tubercular swelling midway; a distinct skinfold on heel and knee. Body elongate, in postaxillary region a little less than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts finely granular, with some coarse granules on sacrum, on upper surface of legs, and behind anus; venter smooth, with a few fine diagonal striations on proximal part of posterior femur; a glandular swelling from posterior corner of eye extending across upper posterior part of tympanum and ending behind it; no skinfold across the chest; no ventral disk; external vocal sacs in the male indicated by lateral skinfolds at sides of chin.

Dimensions.—Head and body, 21 mm.; head length, 7 mm.; head width, 6.5 mm.; femur, 9 mm.; tibia, 10.5 mm.; foot, 8.5 mm.; hand, 6 mm.

Color in alcohol.—Dorsum black, with a narrow slate-gray dorsolateral line beginning at snout tip, continuing on canthus and upper eyelid and above tympanum, and lightening to pearl gray on the side, where it ends in a large oval pearl gray spot on upper anterior femur; a similar pearl gray spot in axilla, continuing on lower surface of upper arm to elbow, and another one on concealed surface of tibia behind and below the knee; venter black, with a fine gray reticulation on posterior half of belly and a gray patch on lower inner halves of femora united on the midline; side of head black, with a fine pearl gray line beginning as a small crescentic mark on tip of snout, touching lower edge of nostril, crossing lip diagonally and ending above shoulder; soles of feet and palms of hands black, their disks and tubercles lightening to drab-gray.

Remarks.—The structure and markings of this form are rather like those of *Dendrobates lugubris*, but numerous differences can be noted. The adult *D. hahneli* is smaller; the pale axillary spot does not exist in *D. lugubris;* and in *hahneli* the light ventral reticulations are confined to the posterior half of the abdomen and the dorsolateral lines are much finer and sharper than in *lugubris.*

While the first finger usually is slightly shorter than the second in *hahneli,* both are equal in length in about 10 percent of the examples at hand.

The Putumayo frog (CNHM 61789) has a snout length equal to 1¼ times the eye diameter, while the interorbital width is broader than that of the upper eyelid. In his original description, Boulenger stated that the snout and eye were equal in length and that the interorbital width was greater than that of the upper eyelid.

Apparently this species is the only one of the genus found east of the Andes in Colombia, and the examples from Meta and Putumayo seem to agree well with the description of Boulenger's type from Yurimaguas, in northern Peru. More material from both countries is needed to determine whether truly significant differences in bodily proportions might warrant separation. Until more Putumayo specimens are examined, it is not feasible to consider a separation on these extremely variable characters.

Specimens Examined

COLOMBIA

Meta: Caño No. 2, near Camp 1, Macarena, and shore of Guayabero, USNM 144950–8; Guayabero River shore above El Refugio, USNM 144959–61; Upper Güejar and El Mico, in the Macarena, USNM 144962–7.

Putumayo: Umbría, CNHM 61789.

PERU: Orellana: Campo Santa Clara, USNM 127201, 127203–8; Domo Santa Clara, USNM 127932.

Dendrobates lugubris O. Schmidt

Plate 2a–c

1858. *Dendrobates lugubris* O. Schmidt, p. 250, pl. 2, fig. 14 (type localities, New Granada and Costa Rica, on road between Boca del Toro and Chiriqui Volcano).—Boulenger, 1882a, p. 145.—Baumann, 1917, pp. 132, 134.—Dunn, 1944c, p. 520.—Stebbins and Hendrickson, 1959, p. 502.—Gorham, 1963, p. 25.

1924. *Phyllobates lugubris.*—Dunn, 1924, p. 5.—Taylor, 1952, p. 639, fig. 10.

Description.—USNM 146850, an adult from Mariquita, Tolima, Colombia. Tongue very slender, slightly more than one-quarter as wide as mouth opening, ovate, its posterior border free and unnotched; snout nearly truncate at the tip when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about half their distance from eye. Canthus rostralis rounded; loreal region flat, vertical, descending to the vertical upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter twice that of upper eyelid, a little greater than interval between nostrils. Tympanum large, distinct, its greatest diameter three-quarters that of eye, its anterior border practically in contact with eye socket. Fingers long, with faint lateral ridges, free, first finger a little shorter than second, which equals fourth; tips of second and fourth fingers reaching to base of penultimate phalanx of third, the disk of which covers about one-third the tympanum; a very small round thumb pad present; a large palmar callus; metacarpal tubercles well developed. Toes moderate, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; disk of fourth toe covering one-third the tympanum and nearly the same size as that of third finger; a small oval inner metatarsal tubercle and a round outer one of about the same size; a faint tarsal ridge, ending in a short diagonal gland midway to heel; a heavy skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts finely granular; a wide flat dorsolateral gland from tip of snout, above eyelid and along sides to groin; venter nearly smooth, with a few pustules on chest, on posterior abdomen, and below anus; no supratympanic ridge; a few fine skinfolds across the chest and throat; a ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 31.5 mm.; head length, 10 mm.; head width, 10 mm.; femur, 13 mm.; tibia, 14.5 mm.; foot, 12 mm.; hand, 10 mm.

Color in alcohol.—Dorsum black, with a slate-gray dorsolateral stripe covering the gland from tip of snout to groin; a large roundish gray spot on proximal part of anterior femur, and an elongate irregular gray spot on outer half of femur, ending on knee; posterior femur with large irregular gray spots on a black ground; tibia, foot upper arm, and forearm similarly spotted; venter black with wide gray crossbands or spots; lower limb surfaces similarly marked; sides of head black, with a gray crescentic mark below eye; palms of hands and soles of feet black, the tubercles and disks drab-gray. Some juveniles (USNM 147159–63) have light areas on back, and sides chromium to apple green; light areas of belly olive-yellow, the chin sometimes citron yellow.

Remarks.—This species has been considered in the genus *Phyllobates* by Dunn (1924) and by Taylor(1952), although Dunn (1944c) later reversed his opinion by restoring it to the genus *Dendrobates*. As there are no traces of maxillary teeth in the numerous Colombian specimens at hand, its position in the genus *Dendrobates* is accepted here.

Three tadpoles (USNM 144985) that possibly are of this species were collected at Volcanes, Caparrapí, Cundinamarca, by E. R. Dunn on October 20, 1943. The largest one measures 7 centimeters in head and body length and 11 centimeters in tail length; the respective measurements of the smallest one are 6.5 and 9.5 millimeters.

The first finger is slightly to distinctly shorter than the second in nearly all of the adult examples at hand. The adpressed heel may reach to the center or the posterior corner of the eye or, rarely, only to the tympanum.

Sometimes, in preservative, the light markings no longer are apparent, and the whole body appears slate-colored or blackish. Such examples closely resemble *D. trivittatus*, which also is often very dark after preservation; however, the long first finger in *trivittatus* and the much shorter one in *lugubris* should serve to differentiate the two. Dunn previously had identified USNM 48865 from Truando as "*auratus*?," but that specimen appears to be more like the all-black *lugubris*.

One specimen (USNM 145098) still has traces of primrose yellow on the light dorsolateral lines and on the light areas on sides and jaws; other examples (USNM 145099–100, 145102–3) are pale Nile blue in those areas.

Specimens Examined

COLOMBIA

ANTIOQUIA: Nechí, Cauca River, 100 m., CNHM 54275; Santuario, USNM 150687–91; Uraba, Río Currulao, CNHM 63878; Villa Arteaga, USNM 144948.

BOLÍVAR: Catival, upper Río San Jorge, 120 m., CNHM 61181.

CALDAS: Pereira, MLS 314–5; Santa Cecilia, Pueblo Rico, CNHM 54200.

CHOCÓ: Bahía Utría, CNHM 81870, La Victoria, near Pepé; USNM 150168; "New Granada," ANSP 2722–3; Río San Juan, USNM 144944; 10–15 mi. west of Playa de Oro, USNM 147159–63; "Truando," USNM 48865, 122104; Unguía, Golfo de Urabá, CNHM 63877.

CUNDINAMARCA: East base of Cordillera, and extreme limits of llanos, ANSP 24324–31; north of Albán, MLS 387; Volcanes, Caparrapí, USNM 144985 (three tadpoles, probably of this species).

MAGDALENA: Río Frío, MCZ 16059–64, USNM 118223.

SANTANDER: El Centro, USNM 144968–9; Finca El Mosco, near Lebrija, USNM 144970; Finca La Esmeralda, near Lebrija, USNM 144971–3; Simacota, ANSP 25763.

TOLIMA: Chicoral, ANSP 21030; Espinal, USNM 98891–3; Mariquita, USNM 144974–7, 146850–6, CNHM 81826–8; Mesa Cucuana, USNM 145095–103; shore of Río Guali, 530–550 m., Mariquita, USNM 144978–9.

PANAMA: Almirante, USNM 118231.

Dendrobates opisthomelas **Boulenger**

PLATE 2G–I

1899. *Dendrobates opisthomeleas* Boulenger, p. 275, pl. 11, fig. 4 (type locality, Santa Inéz, north of Medellín, Antioquia, 3,800 ft., Andes of Colombia).—Gorham, 1963, p. 25.

Description.—USNM 145794 (formerly BM 1947.2.15.30, cotype), an adult from Santa Inés, north of Medellín, Antioquia, Colombia. Tongue relatively large, three-fifths as wide as mouth opening, ovate, its posterior border free and unnotched; snout broadly rounded when viewed from above, rounded and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-third their distance from eye. Canthus rostralis broadly rounded; loreal region flat, vertical, in line with the vertical upper lip. Eye large, prominent, its diameter a little greater than its distance from tip of snout; interorbital diameter 1⅓ times that of upper eyelid, slightly less than interval between nostrils. Tympanum distinct except on its upper posterior border, its greatest diameter about one-third that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderate, with faint lateral ridges, free, first finger much shorter than second, fourth a trifle longer than second, its tip reaching to base of penultimate phalanx of third, the disk of which covers half the tympanum; a small oval thumb pad present; a larger rounded palmar callus; metacarpal tubercles well developed. Toes long, third toe much longer than fifth, its disk reaching just beyond base of antepenultimate phalanx of fourth; disk of fourth toe covering half the tympanum and approximately equal to that of third finger; a small inner metatarsal tubercle and a smaller but equally distinct outer one; no true tarsal ridge, but a diagonal gland midway between heel and inner metatarsal tubercle; a strong skinfold on heel and knee. Body moderate, in postaxillary region a little wider than greatest width of head. When hind leg is adpressed, heel reaches anterior corner of eye; when limbs are laid along the sides, knee and elbow greatly overlap; when hind legs are bent at right angles to body, heels slightly overlap. Skin granular on back and sides, especially so on sacrum; head nearly smooth; belly finely granular; chin and chest smooth; a swelling behind eye, and a distinct glandular ridge beginning behind eye and descending behind tympanum, covering its upper posterior rim, ending on shoulder; no skinfold across the chest; a faint ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 18 mm.; head length, 6 mm.; head width, 5.5 mm.; femur, 7.5 mm.; tibia, 8 mm.; foot, 7 mm.; hand, 5.5 mm.

Color in alcohol.—Dorsum seal brown; upper limb surfaces sepia; venter sepia, with large light ecru drab spots on chin, chest, and belly, these spots extending on the sides where they darken to merge with the dorsal color; a large pale ecru drab spot on underside of upper arm from axilla nearly to elbow, and some smaller and less distinct light spots on anterior proximal femur and in groin; side of head drab, with a pale stripe along upper lip border from tip of snout extending to shoulder; palms of hands and soles of feet drab, their disks and tubercules a little lighter.

Remarks.—This minute frog seems to be confined to Antioquia. The head appears to be both longer and wider in relation to total length than in any other Colombian species of *Dendrobates*, although *hahneli* and *minutus ventrimaculatus* approach its lowest proportions. The heel reaches to the anterior corner of the eye in *opisthomelas*, but not beyond its posterior corner in *minutus ventrimaculatus*.

Specimens Examined

COLOMBIA

Antioquia: Llano Grande, Río Negro, CNHM 63874–5, USNM 147224; Medellín, AMNH 1372–4, 5194–6, USNM 147506–7; probably Medellín, AMNH 1364; Santa Inés, north of Medellín, 3,800 ft., USNM 145794 [formerly BM 1947.2.15.30] (cotype).

Dendrobates minutus ventrimaculatus **Shreve**

PLATE 3D–F

1935. *Dendrobates minutus ventrimaculatus* Shreve, p. 213 (type locality, Sarayacu, Ecuador); 1947b, p. 316.—Marx, 1958, p. 431.

Description.—USNM 146843, an adult female from Aserrío, near Río Pescado, Caquetá; Colombia. Tongue a third as wide as mouth opening, oval, its posterior border free and unnotched; snout nearly truncate when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about a fifth their distance from eye. Canthus rostralis rounded but distinct; loreal region flat, vertical, continuous with upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1⅓ times that of upper eyelid, a little less than interval between nostrils. Tympanum distinct, its greatest diameter half that of eye, scarcely separated from eye. Fingers moderate, with lateral ridges, free, first finger much shorter than second, fourth longer than second and reaching to base of penultimate phalanx of third, the disk of which covers about three-fourths the tympanum; a small oval thumb pad present; a small round palmar callus; metacarpal tubercles well developed. Toes moderate, third toe slightly longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; disk of fourth toe covering about a third the tympanum, and smaller than that of third finger; a distinct oval inner metatarsal tubercle and a smaller round outer one; a distinct tarsal ridge, ending at heel, with a small crescentic swelling near its center; a skinfold on heel and knee. Body moderately elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches to posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts smooth (pustular under the lens); venter minutely granular, the throat and chest less so; a very fine glandular ridge from posterior corner of eye, above tympanum, and ending on side; a weak skinfold across the chest; a slight ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 16 mm.; head length, 5 mm.; head width, 5 mm.; femur, 6.5 mm., tibia, 7 mm.; foot, 7 mm.; hand, 4.5 mm.

Color in alcohol.—Dorsum black, with a rather narrow drab-gray dorsolateral line starting on snout, continuing along canthus and eyelid on the side to groin and ending on anterior femur in a wider irregular gray spot; a short median drab-gray line beginning between the eyes, forking anteriorly to join the pale canthal line in front of the eyes and ending between the shoulders; limbs black above, with a few indistinct gray transverse spots on tibia, foot and forearm; posterior femur black near the body, becoming paler on distal half, this pale area continuing behind the knee and on proximal one-third of tibia; venter drab-gray, with several large round black spots on belly; a wide black band across throat; a pair of large lateral black spots on chin, and a small median black spot on tip of chin; sides of head black, with a gray line along upper lip border; sides of body black, with an indistinct gray lateral strip; soles of feet and palms of hands black, the tips of the digits lightening to drab gray.

MLS 42a is very similar to the described specimen but has several black spots across the throat instead of a single wide black band.

Remarks.—The frog from the watershed of Río Pastaza, Ecuador, reported by Andersson (1945) as *Dendrobates tinctorius* Schneider undoubtedly is *D. minutus ventrimaculatus*, as Andersson's color description agrees with the original description of this subspecies as well as with the specimens at hand.

Although we do not have enough specimens to make an adequate variational study of this subspecies, a few facts about the individuals at hand may be mentioned. In all six, the first finger is much shorter than the second. The heel reaches to the center of the eye in three individuals, to its posterior border in two specimens, and to its anterior border in one example.

Five examples (USNM 146834–8, collected by Hno. Nicéforo María) from Sutatenza, Antioquia, are quite similar to those mentioned above but differ from them in being much lighter in color. No maxillary teeth can be found; otherwise, they might be grouped with one of the smaller kinds of *Phyllobates*.

Specimens Examined

COLOMBIA
  Caldas: Santa Cecilia, Pueblo Rico, CNHM 54203, 54223.
  Caquetá: Aserrío, near Río Pescado, USNM 146843–5.
ECUADOR: Oriente: Río Pastaza, 500 m., USNM 118705.

Dendrobates minutus minutus **Shreve**

Plate 3a–c

1958. *Dendrobates minutus minutus* Shreve, p. 212 (type locality, Barro Colorado Island, Panama).
1963. *Dendrobates minutus.*—Gorham, 1963, p. 25.

Description.—USNM 144980, an adult from La Ceja, Monte del Diablo, Antioquia, Colombia. Tongue almost half as wide as mouth opening, oval, its posterior border free and unnotched; snout broadly rounded when viewed from above, truncate and slanting backwards in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout being half their distance from eye. Canthus rostralis bluntly rounded; loreal region flat, vertical, continuous with the upper lip. Eye large, prominent, its diameter about 1¼ times its distance from tip of snout; interorbital diameter a little greater that that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter about one-third that of eye, separated from eye by an interval equal to one-quarter its own diameter. Fingers moderate in length, with faint lateral ridges, free, first finger much shorter than second, fourth a little longer than second, its tip reaching to base of penultimate phalanx of third, the disk of which covers about three-quarters the tympanum; all the finger disks relatively large; an indistinct thumb pad present; a round palmar callus; metacarpal tubercles well developed. Toes moderate, with traces of a web between the three outer ones, third toe longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; disk of fourth toe covering two-thirds the tympanum and smaller than that of third finger; an indistinct inner metatarsal tubercle and a poorly defined outer one; no true tarsal ridge, but a short diagonal gland crossing tarsus midway to heel; a distinct skinfold on heel and knee. Body moderately elongate, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches to posterior corner of eye, and tibiotarsal articulation reaches to tip of snout; when hind limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, knees touch. Skin of upper parts faintly granular, except top of head, which is smooth; venter smooth (pustular under the lens); a pronounced swelling behind eye and a wide glandular ridge from posterior corner of eye descending behind tympanum and ending above shoulder; no skinfold across the chest; a slight ventral disk; no external vocal sacs apparent in the male.

Dimensions.—Head and body, 17.5 mm.; head length, 5.5 mm.; head width, 6 mm.; femur, 7 mm.; tibia, 7.5 mm.; foot, 6 mm.; hand, 4.5 mm.

Color in alcohol.—Dorsum clove brown, with a small lighter sepia spot on knee, heel, and elbow; venter seal brown, with a wide drab band across throat and a small drab spot near tip of chin; sides of head clove brown, lightening to sepia near edge of upper jaw; posterior femur clove brown, unspotted; soles of feet and palms of hands sepia, their disks and tubercles a little lighter.

Remarks.—While the La Ceja frogs are darker and show less pattern than typical *D. minutus* from Barro Colorado Island, Panama, they agree with the topotypes of *minutus* in all other essentials. When more examples from both localities have been collected and studied, the actual range in color pattern may be found to be quite similar. Of four tadpoles (USNM 144984) that were collected with the La Ceja frogs, the smallest has a head and body length of 6 millimeters and a tail length of 13 millimeters and the largest has respective measurements of 9 and 16 millimeters. The appearance of minute hind legs on the latter tadpole shows the beginning of metamorphosis.

The faint traces of webs between the outer toes in this subspecies is unusual in the genus *Dendrobates*, in which most forms have the toes, as well as the fingers, completely free.

Specimens Examined

COLOMBIA

Antioquia: La Ceja, Monte del Diablo, USNM 144980–4.

PANAMA: Barro Colorado Island, MCZ 15288 (holotype), ANSP 23126, 23200; Gatún, ANSP 21441–4.

***Dendrobates tinctorius wittei* Laurent**

Plate 5a–c

1923. *Dendrobates tinctorius* (not of Schneider).—Barbour, 1923a, p. 13.—Breder, 1927a, p. 72, photograph.

1942. *Dendrobates tinctorius wittei* Laurent, p. 12, fig. 17 (type locality, Los Mangos, [Magdalena?] Colombia).

Description.—USNM 124223, an adult from one kilometer west of

Andagoya, Chocó, Colombia. Tongue small, one-fourth as wide as mouth opening, ovate, its posterior border free and unnotched; snout wide at the tip and nearly truncate when viewed from above, flat and slanting backwards in profile, the upper jaw extending well beyond the lower. Nostrils inferolateral, slightly projecting, their distance from end of snout a little less than their distance from eye. Canthus rostralis bluntly rounded; loreal region slightly concave, vertical, descending straight to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1⅔ times that of upper eyelid and a little greater than interval between nostrils. Tympanum fairly distinct, its greatest diameter half that of eye, separated from eye by an interval equal to about one-third its own diameter. Fingers moderate, with enlarged disks, without lateral ridges, free, first finger shorter than second, fourth equal to second, their tips reaching just beyond base of penultimate phalanx of third, the disk of which covers nearly half the tympanum; no apparent thumb pad or palmar callus; metacarpal tubercles scarcely evident. Toes moderate, with small disks, third toe longer than fifth, its disk reaching halfway along antepenultimate phalanx of fourth; disk of fourth toe covering about one-fourth the tympanum and much smaller than that of third finger; a weak oval inner metatarsal tubercle and a very small outer one; no tarsal ridge; a prominent skinfold on heel and knee. Body moderate, in postaxillary region smaller than greatest width of head. When hind leg is adpressed, heel reaches to posterior corner of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels barely touch. Skin of upper parts smooth (under the lens appearing minutely pustular everywhere); venter minutely pustular, with a few small flattened granules on posterior part of belly and below vent; no glandular ridge behind eye, but instead a glandular swelling suggesting a parotoid gland; no skinfold across chest; no ventral disk; no external vocal sacs.

Dimensions.—Head and body, 35.5 mm.; head length, 10.5 mm.; head width, 10 mm.; femur, 14 mm.; tibia, 15 mm.; foot, 12.5 mm.; hand, 10.5 mm.

Color in alcohol.—Black above, with many rounded silvery-white spots, smaller on anterior parts, much larger on sacrum; upper surfaces of legs black, with one large white spot and two smaller ones taking the position of the usual diagonal crossbars; arms black above, with a large white spot on both upper and lower arm; sides white with a few black dots; venter pearl-gray, with an irregular black patch on center of throat; edges of lower lips with small black dots or spots; region around anus black; some black areas on lower limb surfaces corresponding to position of dorsal silvery crossbands; upper lip edged with black; a large white spot on loreal region extending below eye and another on tip of snout. (In life, the silvery-white spots were rich geranium-pink, as traces of that color still remain on some other individuals of this lot.)

Remarks.—The anomaly of possibly three subspecies of a single species occurring in the Chocó can be explained by plotting their distribution on a map. One form, *D. tinctorius histrionicus*, comes from inland and southward, in the valley between the Central and the Western Cordilleras. Another, *D. t. chocoensis*, appears to be only from the vicinity of Andagoya. The third one, *D. t. wittei*, is found from the seacoast west of the Western Cordilleras, along the Río Pepé to Andagoya and somewhat to the east. Near Andagoya are watersheds for three rivers—the Atrato, running north to empty into the Caribbean, the San Juan, running south and west to the Pacific; and the Baudó, flowing west, more directly to the Pacific. Specimens from Sierra de Baudó have been classified as probable intergrades between *D. t. wittei* and *D. t. chocoensis*, but intensive collecting is needed to decide the advisability of putting *wittei* into the synonymy of the latter.

Specimens Examined

COLOMBIA

Chocó: One km. west of Andagoya, USNM 124218–32; Andagoya, BM 1915.10.21.58–61, 1915.10.21.63–5, USNM 145791; Bahía de Utría, USNM 144991; Boca de la Raspadura, Río San Pablo, AMNH 13711–2, 13716–9, USNM 147510; Finca La Victoria, near Pepé on shore of Río Baudó, USNM 144986–90; Upper Condoto, 12,000 ft., BM 1913.11.12.90–3; upper Río Quito, upper bank of Río San Pablo, AMNH 13695–701, 13703–5, 13707–9, USNM 147508–9. [Probable intergrades: *wittei* X *chocoensis*, Sierra de Baudó, ANSP 25617–25.]

Dendrobates tinctorius histrionicus Berthold

PLATE 4G–I

1845. *Dendrobates histrionicus* Berthold, p. 43, pl. 1, fig. 8 (type locality, New Granada).—Funkhouser, 1956, p. 76, 3 figs.—Gorham, 1963, p. 25.
1864. *Dendrobates tinctorius cocteani* (lapsus, for *cocteaui*) Steindachner, p. 261 (type localities, Brazil and Colombia).
1913. *Dendrobates tinctorius cocteaui.*—Boulenger, 1913, p. 1027, pl. 104, figs. 2–4.
1942. *Dendrobates tinctorius histrionicus.*—Laurent, 1942, p. 12, figs.
1944. *Dendrobates histrionica.*—Dunn, 1944c, p. 520.

Description.—USNM 139778, an adult from 75 miles south of Andagoya, Chocó, Colombia. Tongue almost half as wide as mouth opening, oval, its posterior border free and unnotched; snout truncate when viewed from above, flat and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about two-fifths their distance from eye. Canthus rostralis distinct; loreal region flat, vertical, in line with the vertical upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter a trifle greater than that of upper eyelid, equal to interval between nostrils. Tympanum distinct except on posterior rim, its greatest diameter two-third that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderate, without lateral ridges, free, first finger shorter than second, which is equal to fourth; tips of second and fourth fingers reaching to base of penultimate phalanx of third, the tip of which covers half the tympanum; a very weak thumb pad present; a weak palmar callus; metacarpal tubercles scarcely indicated. Toes moderate, third toe longer than fifth, the disk of which reaches almost to base of penultimate phalanx of fourth; disk of fourth toe covering about one-fourth the tympanum and much smaller than that of third finger; a small, round, prominent inner metatarsal tubercle, and a smaller round outer one; no tarsal ridge; a skinfold on heel and knee. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts smooth (minutely pustular under the lens); venter smooth; no glandular ridge from posterior corner of eye, but a slight swelling in parotoid area; no skinfold across chest; no ventral disk; no external vocal sac apparent in male.

Dimensions.—Head and body, 33.5 mm.; head length, 10.5 mm.; head width, 10 mm.; femur, 13.5 mm.; tibia, 14.5 mm.; foot, 12 mm.; hand, 10 mm.

Color in alcohol.—Dorsum wood brown, with a large round white spot encircled by a darker border on center of back; venter dark sepia, with a large rectangular dark-bordered white spot covering throat and chest and another on the posterior part of belly; limbs wood brown above, with an oval white spot on posterior surfaces of femur and tibia and on top of foot and forearm; upper lip white from eye forward, including lower anterior snout; rest of head brown; palms of hands and soles of feet brown, the disks a little paler.

Remarks.—This form, whose Latin name means "relating to acting," is another of the frogs having a clown-suit pattern. This pattern is somewhat more regular than in *Dendrobates tinctorius chocoensis*, however, as there is usually a large light spot between the eyes, often covering the whole snout anterior to them. Sometimes a large round or oval light spot occurs on the back above the shoulders, and another on the sacrum, or the entire back may be light. Often, the belly is black, with a large light spot on chin and chest and another one covering the posterior half of the abdomen. An exception is USNM 144945, a specimen in which the venter is light except for a black spot on the tip of the chin and a median one on the posterior part of the abdomen. The sides may be black or light and are sometimes spotted, or they may have a branch of the light middorsal spot extending across the axilla.

The lot of 40 examples (now USNM 147164–203) from Playa de Oro, Río San Juan, Chocó, were received freshly dead at the National Museum on August 7, 1962, and their colors were noted before they were preserved. Usually the back was ochraceous to ochre yellow, with chestnut to chocolate-brown or seal-brown squarish spots and, occasionally, longitudinal stripes. (In one example, the glands above the groin were bright chrome yellow.) The belly was black except for the maize-yellow to dull-cream edge of the lower jaw.

In the most-spotted individual the back was gallstone yellow where not black, the spots being brilliant cadmium yellow. The light area on the legs was pinkish buff, while the centers of the ocelli on head and sides were dull gallstone yellow. The few light areas on the belly were raw sienna.

In other examples the centers of the large ocelli on top of head and on sides, shoulders, arms, and legs were chrome yellow to deep chrome. The belly was solid black, but sometimes there was a pinkish vinaceous spot in the center of the throat.

A year after preservation, some of the frogs were almost uniformly black, the original yellow ocelli being a dull dark gray. Other frogs were pale olive-buff or drab gray, the ocelli quite dark in contrast. These differences may be due to the progressive state of decomposition before preserving, as the frogs did not die simultaneously.

There are no outstanding differences in critical measurements to separate *D. t. histrionicus* from the other subspecies of *D. tinctorius* found in Colombia, although it has a longer tibia on the average than *D. t. wittei* or *D. t. chocoensis* and a somewhat shorter one than *D. t. confluens*. Fortunately, individuals of this group usually are abundant wherever they occur, so we can hope for comparisons of still larger series from future collections.

Specimens from Playa de Oro, Río San Juan, at 400 meters (CNHM 54229 and 54248–74), appear to be intermediate between *D. t. histrionicus* and *D. t. chocoensis* in color pattern.

Specimens Examined

COLOMBIA

Antioquia: Andes, AMNH 14030.

Caldas: Santa Cecilia, Pueblo Rico, CNHM 54184, 54186, 54188, 54190, 54197, 54201–2, 54206, 54208–9, 54211, 54213–20, 54222, 54224–6, 54228, 54231–2, 54234–47; La Selva, CNHM 54227.

Chocó: Andagoya, CNHM 81853 (juv.); 75 mi. south of Andagoya, USNM 139778; Bahía Utría, MLS 188; Finca La Granja, 30 km. from Quibdó, upper Río Atrato, USNM 144945; Pacific coast, MLS 227; 10–15 km. west of Playa de Oro, Río San Juan, USNM 147164–203, 150626–9; Quibdó, MLS 145, 145a; Río San Juan, USNM 144946; Río Sucio, tributary of the lower Río Atrato, USNM 144947; Upper Condoto, BM 1913.11.12.90–3.

Dendrobates tinctorius chocoensis **(Posada Arango)**

Plate 4a–c

1869. *Phyllobates chocoensis* Posada Arango (type locality, Chocó, Colombia).—Deyrolle, 1872, p. 465, pl. 27.

1913. *Dendrobates tinctorius chocoensis*.—Boulenger, 1913, p. 1028, pl. 104 figs. 5, 6.—Laurent, 1942, p. 12.

Description.—USNM 124264, an adult from three miles east of Andagoya, on the road to Opogodó, Chocó Colombia. Tongue about one-third as wide as mouth opening, ovate, long, its posterior border free and unnotched; snout broadly rounded at the tip when viewed from above, flat and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils inferolateral, scarcely projecting, their distance from end of snout about two-thirds their distance from eye. Canthus rostralis rounded; loreal region slightly concave, vertical, and in line with the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter twice that of upper eyelid, about 1½ times the interval between nostrils. Tympanum rather indistinct posteriorly, its greatest diameter about two-thirds that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers moderate, with large disks but no lateral ridges, free, first finger a trifle shorter than second and fourth; tips of second and fourth fingers extending to base of penultimate phalanx of third, the disk of which covers about one-third the tympanum; a small swollen area in place of a definite thumb pad; a small palmar callus; metacarpal tubercles only slightly developed. Toes rather short, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth toe, the disk of which covers one-third the tympanum and equals that of third finger; a small oval inner metatarsal tubercle and a smaller round outer one; a very faint tarsal gland, ending midway to heel; a series of small skinfolds on knee and heel. Body moderately elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to posterior border of tympanum; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts smooth, except for a few pustules on the sides and above the shoulders; venter smooth; a few flat granules behind the vent and on lower femur; no glandular ridge behind eye; no skinfold across the chest; a ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 35.5 mm.; head length, 11.5 mm.; head width, 10.5 mm.; femur, 13 mm.; tibia, 15 mm.; foot, 12 mm.; hand, 10 mm.

Color in alcohol.—Dorsum olive-buff, with several irregular sepia spots on the back; top and sides of head and snout immaculate; upper limb surfaces olive-buff, with an irregular sepia crossband on femur, another on distal part of tibia, and two or three fainter ones on outer part of foot and across upper arm and forearm. Venter clove brown, the borders of the lower lip fading to drab; an indistinct sepia band across the chest; lower limb surfaces clove brown to sepia, with a pale drab spot covering outer and lower part of knee; palms of hands and soles of feet dark sepia, their disks and tubercles fading to wood brown.

A note with specimen BM 1915.10.21.52, from Andagoya, states that in life the color was "above merging shades of orange and yellow; below dark to black brown."

Remarks.—The varied dorsal pattern of *D.t. chocoensis* suggests a "clown suit" of very irregular dark spots on a light ground. Usually the sides and sometimes the chest are light, while the belly is black. The dark dorsal spots are different in size and arrangement in all specimens. Usually the snout is light, although it may have a dark spot in the center or on one side of it. The arms and legs often are light above, but most of the Peña Lisa and Río Condoto examples have dark spots or bands on the limbs.

This subspecies tends to have a proportionately shorter tibia and hand than the other Colombian forms in the *tinctorius* group. *D.t. wittei* also has a fairly short tibia, but it can be easily distinguished from *D. t. chocoensis* because of its dark dorsum with small evenly scattered light spots.

Specimens Examined

COLOMBIA

Chocó: Andagoya, BM 1915.10.21.51–7, 1916.4.25.23–4, USNM 145792, 146839, 144941–4, CNHM 81850–2; Peña Lisa, Condoto, BM 1913.11.12.81–8, and 1914.5.21.78–80; Río Condoto, Río San Juan, BM 1915.10.21.82–78; road to Opogodó, three mi. from Andagoya, USNM 124262–4.

Dendrobates tinctorius confluens Funkhouser

PLATE 4D–F

1956. *Dendrobates histrionicus confluens* Funkhouser, p. 75 (type locality, La Ciudad de Madrigar, about 600 m., Nariño, Colombia).

Description.—USNM 145800 (formerly SUNHM 13250), a paratype from La Ciudad de Madrigar, Nariño, Colombia. Tongue one-third as wide as mouth opening, oval, its posterior border free and unnotched; snout broadly rounded when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis rounded but distinct; loreal region slightly concave, vertical, continuous with the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter equal to that of upper eyelid and equal to interval between nostrils. Tympanum distinct, its greatest diameter about two-fifths that of eye, separated from eye by an interval equal to one-fifth its own diameter. Fingers long, with lateral ridges, free, first finger much shorter than second, fourth longer than either and reaching to penultimate phalanx of third, the disk of which covers half the tympanum; a weak oval thumb pad present; a larger round palmar callus; metacarpal tubercles rather weak. Toes moderate, third toe much longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; disk of fourth toe covering one-third the tympanum and a little smaller than that of third finger; a weak oval inner metatarsal tubercle and a larger round outer one; a slight tarsal ridge, ending at heel; a heavy skinfold on heel and knee. Body elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior edge of tympanum; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts smooth (pustular under the lens); venter smooth, except for some small tubercles on femur near anus; a weak glandular ridge from posterior corner of eye curving behind tympanum, ending in front of shoulder; a slight skinfold across the chest; a weak ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 32 mm.; head length, 10 mm.; head width, 9.5 mm.; femur, 12.5 mm.; tibia, 13 mm.; foot, 11.5 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum olive-gray with many small irregular black spots scattered over head, body, femur, and tibia; venter slate color marbled with black; chin, throat, and chest covered by an irregular black spot; lower surfaces of legs, feet, and hands black; sides olive-gray with minute black dots which merge to form black patches in axilla and around shoulder and in groin; side of head olive-gray, the edge of upper lip black; nostrils, tip of snout, and canthus with irregular black reticulations; posterior femur olive-gray with fine black dots; disks and tubercles on feet and hands pale drab-gray. SUNHM 13267 has retained some of its original color, as it is pale geranium pink above and on the sides and small slate-colored spots are scattered over the back. The venter is smoke-gray, with the lower jaw rimmed with black; a large black spot occurs on center of throat, and there are some fine scattered short black lines on the belly. The femur and tibia are black below, the black area having an irregular margin. The feet and hands are black above and below except for the disks and tubercles, which are smoke-gray. A narrow black ring extends around base of arm and leg, widening in axilla and groin, and merging on the femur with the black of the lower surface. An irregular black crescentic mark occurs just above the arm and some distance behind the tympanum. The upper lip has a spot of bright geranium pink below the eye, preceded by a vertical black spot. The tip of the snout, canthus, and nostrils are irregularly black-spotted. Several other frogs from the same place show some pink color. Those spots that have faded to gray have the appearance of lichens, as the small irregular black marks occur at random over the upper surface.

Remarks.—Specimens in the series ANSP 25349–52, from La Guayacana, Nariño, are said by Funkhouser (1956, p. 75) to be intermediate between *confluens* and *sylvaticus* (from nine kilometers west of Santo Domingo de los Coloradas, Pichincha Province, in northwestern Ecuador) but to be closer to the former. In addition to these specimens mentioned by Funkhouser, three others (CNHM 61772–3, 61775) from La Guayacana have been similarly identified by the present authors.

The most noticeable structural difference between *D. t. confluens* and *D. t. tinctorius* is the significantly longer foot of the former, whose head width and tibial length also appear to be slightly greater.

Specimens Examined

COLOMBIA

Cauca: Popayán, 1,700 m., CNHM 61774.

Nariño: La Ciudad de Madrigar, SUNHM 13151 (holotype), 13251–66, (paratypes), USNM 145800–1 [formerly SUNHM 13250, 13267]; Río Mataje, USNM 147317–9; Río Mira, Imbilí, USNM 147401–29.

Genus *Phyllobates* Duméril and Bibron

1841. *Phyllobates* Duméril and Bibron, p. 637 (type species, *P. bicolor* Duméril and Bibron).

Generic diagnosis.—Pupil horizontal. Tongue elliptic or subcordiform, free behind. Vomerine teeth absent; maxillary teeth present, sometimes weak. Fingers and toes dilated into regular disks subdivided above. Outer metatarsals united. Omosternum cartilaginous; sternum a cartilaginous plate. Terminal phalanges T-shaped.

Key to Colombian Species of *Phyllobates*

- *a^1*. Toes free, or barely webbed.
  - *b^1*. No light lateral or dorsolateral stripes; first finger slightly longer than second; toes free; heel reaching between posterior border of eye and nostril; skin resistant to abrasion; belly usually slate color posteriorly (in alcohol), lighter anteriorly; size to 42.5 mm . . . . **P. bicolor**
  - *b^2*. A light dorsolateral stripe, sometimes faint.
    - *c^1*. First finger longer than second; heel reaching between anterior and posterior corners of eye.
      - *d^1*. Belly with coarse dark reticulations continuing on throat and forming a pair of short parallel stripes on chin; toes not webbed; size to 22 mm. **P. boulengeri**
      - *d^2*. Chin and anterior part of belly black, posterior part marbled dark and light; third and fourth toes with a slight web, other toes free; size to 25.5 mm. . . . . **P. femoralis**
    - *c^2*. First and second fingers subequal; heel reaching between posterior border of tympanum and eye; belly drab with heavy dark reticulations; toes webbed at base to one-eighth webbed; size to 30.5 mm . . **P. mertensi**
- *a^2*. Toes webbed at base to two-thirds webbed.
  - *b^1*. First finger shorter than second, or subequal.
    - *c^1*. First finger shorter than second.
      - *d^1*. Toes webbed at base; heel to posterior border of tympanum; belly pinkish buff with small scattered sepia spots; size to 22 mm. **P. subpunctatus subpunctatus**
      - *d^2*. Toes one-fourth to two-thirds webbed.
        - *e^1*. Belly spotted.
          - *f^1*. Belly with dark spots and reticulations; toes one-third webbed; heel to between eye and nostril; size to 32.5 mm . . **P. thorntoni**
          - *f^2*. Belly with a coarse dark network; toes one-half webbed; heel to anterior corner of eye; size to 27.5 mm. . . . . . **P. chocoensis**
        - *e^2*. Belly immaculate; heel to tip of snout; size to 22.5 mm . . **P. vergeli**
    - *c^2*. First and second fingers subequal.
      - *d^1*. Toes nearly one-fourth webbed; size to 25 mm. **P. subpunctatus walesi**
      - *d^2*. Toes one-third to one-half webbed; belly immaculate drab; size to 36.5 mm. . . . . **P. palmatus**
  - *b^2*. First finger longer than second.
    - *c^1*. Toes one-fourth webbed; heel to center of eye; belly drab with a few darker spots below femur and tibia; size to 28.5 mm . . . **P. inguinalis**
    - *c^2*. Toes webbed at base to one-eighth webbed.
      - *d^1*. Heel to anterior eye; belly immaculate or finely spotted; size to 22.5 mm. . . . . **P. brunneus**
      - *d^2*. Heel to center of eye.
        - *e^1*. Belly immaculate buff; size to 18 mm. . . . . **P. pratti**
        - *e^2*. Belly immaculate except for a dark line around lower jaw and a patch of dark dots below shoulder; size to 26 mm . . . **P. latinasus**

Phyllobates bicolor Bibron

PLATE 6A–C

1841. *Phyllobates bicolor* Bibron, p. 235, pl. 29 (type locality, "Cuba" in error; suggested as probably Colombia by Dunn, 1944c).—Duméril and

Bibron, 1841, p. 638.—Günther, 1858, p. 90.—Dunn, 1944c, p. 491; 1957, p. 77.—Cochran, 1961, p. 107, fig. 39.—Gorham, 1963, p. 25.

1847. *Phyllobates melanorrhinus* Berthold, p. 14, pl. 1, fig. 7 (type locality, Popayán, [Cauca,] Colombia).

1923. *Phyllobates nicefori* Noble, p. 1 (type locality, "town of Andes," [Antioquia,] Colombia).

Description.—USNM 137360, an adult female from Popayán, Cauca, Colombia. Head rather short; tongue half as wide as mouth opening, ovate, its posterior border free and unnotched; snout broadly rounded when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils lateral, projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis rounded; loreal region flat, vertical, in line with the vertical upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter one-half that of upper eyelid, equal to interval between nostrils. Tympanum very distinct anteriorly, less so posteriorly, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers moderate in length, without lateral ridges, free, with distinct disks; first finger a little longer than second and equal to fourth, the tips of first and fourth reaching to base of penultimate phalanx of third, the disk of which covers about one-fourth the tympanum; a small round thumb pad present; a larger palmar callus; metacarpal tubercles well developed. Toes free, with faint lateral ridges, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; disk of fourth toe covering one-third the tympanum and slightly larger than that of third finger; a small oval inner metatarsal tubercle and a still-smaller, round outer one; a slight tarsal ridge ending in a heavy diagonal gland midway to heel; a heavy skinfold on heel and knee. Body moderately elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts smooth (finely pustular under the lens) and very resistant to abrasion; venter smooth, except for a few small granules on posterior part of abdomen and on lower femur beside the vent; no glandular ridge from posterior corner of eye; a very slight skinfold across chest; no ventral disk; no external vocal sacs apparent in the male.

Dimensions.—Head and body, 42.5 mm.; head length, 14 mm.; head width, 13.5 mm.; femur, 18.5 mm.; tibia, 20 mm.; foot, 16 mm.; hand, 12 mm.

Color in alcohol.—Dorsum uniform pearl gray; upper limb surfaces with numerous, very small slate-gray dots which are set closer together on outer parts and merge into a nearly uniform slate color on lower surfaces of limbs and posterior part of belly; throat, chest, and anterior half of belly cinerous, immaculate; a black crescentic mark around lower anterior rim of tympanum; nostrils and borders of lips black; soles and palms slate gray, the disks and tubercles much paler.

While alive (at the National Zoological Park in Washington, D.C.) this frog and 11 others from the same region had bright red-orange backs, and the upper surfaces of the femur, tibia, and arm were yellowish.

In alcohol, the Peruvian example (CAS 85151) is straw yellow to cream color, with large black spots between the shoulders merging into a black network on posterior half of back; lower surfaces of limbs black; a triangular black mark on center of belly; chest and throat with scattered black dots; and disks and tubercles of hands and feet dark brown.

Remarks.—In its critical measurements, this species shows no more than a normal coefficient of variability—that is, from 4.6 to 6.0. The toes lack webs, and the tongue is unnotched. The skin is resistant to abrasion, as most of the recently collected specimens and many of the older examples are quite free of holes or tears. The heel reaches the anterior border of the eye or as far as the nostril in over 80 percent of the frogs examined; in less than 20 percent it reaches the center or the posterior border of the eye. The body length of 42.5 millimeters places *Phyllobates bicolor* among the largest species of the genus.

Specimens Examined

COLOMBIA

ANTIOQUIA: Andes, AMNH 14028–9 (paratypes of *P. nicefori* Noble); Medellín, AMNH 13540, 39081.

CALDAS: Santa Cecilia, Pueblo Rico, CNHM 54183, 54187, 54189, 54193–4, 54196, 54204–5, 54207, 54212, 54221, 54233, USNM 147225–6, ANSP 25755.

CAUCA: Popayán, USNM 137359–70; Quintana, 3,200 m., AMNH 54183.

CHOCÓ: 75 mi. south of Andagoya, USNM 139776–7; Atrato River, USNM 53168, 53170–1; Juntas de Tamaná, BM 1910.7.11.53; 10–15 km. west of Playa de Oro, USNM 146630–1, 147204–7, 150632–7; mountains above Playa de Oro, USNM 150638–42; Río San Juan, USNM 144994; Río Sipi headwaters, 5,000 ft., BM 1915.10.21.46–7; Río Truando, USNM 48865, 122104 [formerly USNM 4349]; Sierra de Baudó, ANSP 25490; upper Atrato River, ANSP 25756.

VALLE: Camp Carton de Colombia, lower Calima River, USNM 149723–7; El Pailon, 12 km. from Buenaventura, USNM 145105; lower Río Calima, USNM 14506; Virology Field Station, Río Raposo, USNM 151381.

PERU: Tingo Maria, CAS 85151.

Phyllobates boulengeri (Barbour)

PLATE 7A–F

1905. *Prostheraspis femoralis* (not of Boulenger, 1883) Barbour, p. 101 (type locality, Gorgona Island, Colombia).
1909. *Prostherapis boulengeri* Barbour, p. 89 (type locality, Gorgona Island).—Barbour and Loveridge, 1929, p. 323.—Gorham, 1963, p. 25.
1926. *Phyllobates boulengeri*.—Parker, 1926, p. 553.

Description.—USNM 52406 [formerly MCZ 2422, part; cotype of *boulengeri*], an adult female with eggs, from Gorgona Island, Colombia. Width of tongue about one-half that of mouth opening, spatulate, with a very minute indentation on its free posterior border; snout rather short, broadly truncate at the tip when seen from above, rounded in profile, the upper jaw extending well beyond lower; nostrils lateral and well below the canthal angle, their distance from end of snout slightly over half their distance from eye, separated from each other by an interval of about 1½ times their distance from eye. Canthus rostralis rounded but distinct; loreal region flat, with a deep furrow along the edge of the lip, which flares out a little below it. Eye large and prominent, its diameter equal to its distance from tip of snout; interorbital diameter about 1⅓ times the width of upper eyelid, but narrower than distance between the nostrils. Tympanum distinct, about one-half the diameter of eye and located immediately behind it. Fingers long, free, not ridged laterally, first finger a little longer than second, disk of third finger covering about one-fourth the tympanum; subarticular tubercles of fingers large; a small palmar tubercle; toes not webbed, with narrow lateral ridges, third toe much longer than fifth, extending beyond base of antepenultimate phalanx of fourth; disk of fourth toe covering one-fourth the tympanum; a weak tarsal ridge, ending in a diagonal gland across the tarsus proximal to the metatarsal tubercles; a small inner and a smaller outer metatarsal tubercle; subarticular tubercles of toes smaller and less evident than those of fingers. Body moderately elongate, in postaxillary region slightly less than greatest head width; when hind legs are adpressed, heel reaches to posterior corner eye; when limbs are laid along the sides, knees and elbows slightly overlap; when hind legs are laid at right angles to body, heels fail to touch. Skin not easily torn, smooth (minutely pustular) above and below; venter with a few granules beneath anus, and a pair of small flaps above it.

Dimensions.—Head and body, 19.5 mm.; head length, 7 mm.; head width, 6.5 mm.; femur, 8.5 mm.; tibia, 8.5 mm.; foot, 8.5 mm.; hand, 5.5 mm.

Color in alcohol.—Bleached to a nearly uniform pale ecru drab, but with traces of a sepia stripe on the side of the head from nostril to tympanum, another stripe on side of body from armpit almost to groin, and two paler brown stripes on the posterior femur. Center of throat also with pale brown markings.

A large series of specimens (USNM 145248–300) was secured by Dr. Medem on Gorgona Island in 1961. Following is a description of the color pattern of an individual (USNM 145268) in this fresher material: Dorsum drab-gray with a row of irregular sinuous sepia lines on either side of the midline, and a darker, thicker, sepia dorsolateral stripe above a narrow, sharp, white stripe going straight back from posterior corner of upper eyelid to upper insertion of femur; snout paler drab-gray faintly marbled with sepia; canthus rostralis and tip of snout with a light ecru drab line; side of head and body with a wide clove brown stripe extending to groin, its lower edge irregular; a white line from near snout tip along upper lip to shoulder, around armpit, and part way along upper arm; venter white with coarse clove brown reticulations continuing on throat and forming a pair of short parallel stripes on the chin; upper limb surfaces drab-gray, the femur with several diagonal clove brown stripes separated by narrow white lines; tibia and foot with three irregular ocellated sepia crossbands; arm with small sepia spots; lower surfaces of limbs white with scattered clove brown spots; posterior femur clove brown with numerous very small light dots; anterior femur white proximally with irregular clove brown longitudinal markings; soles of feet and palms of hands drab gray, the disks and tubercles lighter.

Except for usual variations in darker or lighter back and more or fewer dark reticulations on lower surfaces, the other specimens of this series have a color pattern very similar to that of the described individual (USNM 145268). Some have the lateral halves of the throat dark, with an irregular white median line and white lip borders. The wide dark lateral band bordered above by the narrow straight white line is the same in all the specimens.

Remarks.—In the Gorgona Island series, the toes usually show a minute trace of a web, which rarely extends as much as one-eighth the distance along the fourth toe. The fingers are long and slender, the first fingers being a little longer, as a rule, than the second. The heel reaches either to the anterior border or the center of the eye in 95 percent of the frogs measured and to its posterior border in the others. The largest frog is 22 millimeters in head-and-body length.

Phyllabates boulengeri deserves to be kept distinct from *Phyllabates femoralis* (Boulenger) because of small but constant differences. For instance, the wide dark lateral stripe meets the white belly color directly in *boulengeri*, but in *femoralis* a narrow white stripe, bordered below by a dark stripe, is found along the lateroventral region paralleling the wide dark lateral stripe. The throat of *boulengeri* shows a wide black sinuous stripe on each side, and its chest and belly are white with some dark spots and reticulations. In *femoralis* the throat and chest and anterior half of belly are uniformly black, while the posterior belly is light with black spots. The foot of *boulengeri* is significantly shorter than that of *femoralis*, and the dorsum and venter of the former species are smooth (minutely pustular under the lens), while the back is distinctly granular in most examples of *femoralis*.

It was interesting to find that specimens of *Phyllabates boulengeri* from Nariño and Valle are identical to those from Gorgona Island instead of being more similar to *Phyllabates femoralis*, a species associated solely with the mainland. In both species the skin is not unduly subject to abrasion. Scarcely a tear appears in the skins of the recently collected series of examples from Gorgona.

Specimens Examined

COLOMBIA

Cauca: Gorgona Island: USNM 52406 (cotype of *boulengeri* Barbour), 118232–3 cotypes of *femoralis* Barbour), 145248–300.

Nariño: Imbilí, Río Mira, USNM 14731–50.

Valle: Camp Carton de Colombia, lower Calima River, USNM 149723–7.

Phyllobates femoralis (Boulenger)

Plate 8a–c

1882. *Prostherapis inguinalis* (not of Cope).—Boulenger, 1882a, p. 138 (part).—Peracca, 1904, p. 15.—Beebe, 1919, p. 209.

1884. *Prostherapis femoralis* Boulenger, 1884a, p. 635 (type locality, Yurimaguas, Huallaga River, northern Peru); 1886b, p. 412; 1898a, p. 118.—Gorham, 1963, p. 25.

1913. *Dendrobates aurotaenia* Boulenger, p. 1029, pl. 104, fig. 1 (type locality, Peña Lisa, Condoto, [Chocó] Colombia, at 300 ft.).—Dunn, 1957, p. 78.

1920. *Phyllobates inguinalis* (not of Cope).—Barbour and Noble, 1920, p. 401.—Noble, 1926b, p. 9.—Crawford, 1931, p. 36.

1935. *Phyllobates femoralis*.—Parker, 1935, p. 506.—Lutz and Kloss, 1952, p. 671.—Goin and Layne, 1958, p. 102.—Dunn, 1957, p. 77.

1957. *Phyllobates auro-taenia*.—Dunn, 1957, p. 78.

Description.—USNM 146872, an adult from Florencia, Caquetá, Colombia. Width of tongue more than half that of mouth opening, spatulate, its free posterior border with three weak lobes; snout moderate, broadly truncate at the tip when seen from above, rounded in profile, the upper jaw extending well beyond the lower; nostrils lateral, placed below the canthal angle, their distance from end of snout about one-half their distance from eye, separated from each other by an interval about 1½ times their distance from eye. Canthus rostralis rounded but distinct; loreal region flat, vertical, with a narrow furrow along its lower boundary from nostril to below the eye;

upper lip rounding outwards very slightly beyond the loreal region. Eye large and prominent, its diameter equal to its distance from end of snout; interorbital diameter a little greater than that of the rather broad upper eyelid, equal to the distance between nostrils. Tympanum distinct, about one-half the diameter of eye and located immediately behind eye. Fingers moderately long, free, without lateral ridges, with small disks, disk of third finger covering about one-eighth the tympanum; first finger longer than second, fourth rather short; subarticular tubercles of fingers very large; a large palmar tubercle present, third and fourth toes with a very short web between them, the other toes without webs; disk of fourth toe covering almost one-half the tympanum; third toe longer than fifth, reaching halfway on antepenultimate phalanx of fourth; subarticular tubercles of toes very small; a heavy, short, transverse glandular ridge across tarsus about one-third the way from inner metatarsal tubercle to heel (which suggests the tarsal tubercle found in some species of *Physalaemus*); a small but distinct inner metatarsal tubercle and a smaller outer one; subarticular tubercles of toes smaller and less evident than those of fingers. No inguinal or lumbar gland. Body rather elongate, in postaxillary region equal to greatest width of head; when hind legs are adpressed, heel reaches to center of eye; when limbs are laid along the sides, knee and elbow greatly overlap; when hind legs are bent at right angles to body, heels slightly overlap. Skin not easily torn, coarsely granular on back, finely granular on tip of snout and on side of body; skin of arms nearly smooth, that of upper leg surfaces coarsely granular; venter smooth.

Dimensions.—Head and body, 25 mm.; head length, 9 mm.; head width, 8 mm.; femur, 10.5 mm.; tibia, 12 mm.; foot, 11.5 mm.; hand, 6.5 mm.

Color in alcohol.—Dorsum black, with a narrow white dorsolateral line from above nostril, above eye, and straight backward along side; a large squarish white spot in upper part of groin and another at armpit; a narrow white lateral line from below arm along side to lower anterior part of groin; legs barred with lighter slate gray diagonal bars; throat and chest black; belly and lower leg surfaces white with many large black spots; palms of hands and soles of feet spotted heavily with black, their corresponding upper surfaces white with a few black dots. A white line beginning below nostril andrunnin g along edge of upper lip and to the shoulder ends in a large crescentic white patch; a second white line beginning below nostril, continuing on edge of upper lip, below tympanum, above arm insertion, and straight back to leg insertion; a third white line, very irregular in outline, from axilla to groin along lateroventral border and paralleling the two upper lines; venter slate-gray anteriorly, the posterior half of belly and lower limb surfaces marbled with coarse black and white spots.

Remarks.—According to Parker (1935, p. 506), the glandular—or granular—dorsal surface is a distinguishing feature of *Phyllobates femoralis*, separating it readily from the smooth-backed *P. inguinalis*, with which it had been confused. The axillary and inguinal spots of *femoralis* are pink in life. Cope does not mention such spots in his original description, but some light areas in these regions are still perceptible in the type specimen.

P. femoralis is recognizable by the combination of a granular back and a peculiar ventral coloration, dark gray or black throat, chest, and anterior belly—at least in the males—and the heavily reticulated surfaces of the posterior belly and lower leg. The back is very granular in most of the specimens examined.

The heel reaches to the center or anterior corner of eye in about 95 percent of the specimens at hand, and to the posterior corner of eye in the others. The coefficient of variability in the head width and hand length—9.2 and 10.6—in the series of 16 examples examined indicates that the series is too small for an adequate estimate of variation in the critical measurements.

Specimens Examined

COLOMBIA
  Amazonas: Puerto Nariño, MLS 4, 4a, 18; Leticia, UF 10016.
  Caldas: Villa Maria, USNM 146863–6.
  Caquetá: Florencia, USNM 146872–3; Morelia, ANSP 25370–1.
  Meta: Acacías, south of Villavicencio, MLS 199; Buenavista, CNHM 81810; Caño Guapaya, Sierra de la Macarena, USNM 147268.
  Putumayo: Mocoa, MCZ 33275–7 (tadpoles); Umbría, CNHM 61790.
  Valle: Virology Field Station, Río Raposo, USNM 151382.
BRITISH GUIANA: Kartabo, USNM 118075.
PERU: Ceja de Montaña, Huanuco, JP 0408a–b; Domo Santa Clara, Orellana, USNM 127202; Quebrada Aqua Dulce, USNM 127210–3.

***Phyllobates mertensi* Cochran and Goin**

Plate 6g–i

1964. *Phyllobates mertensi* Cochran and Goin, p. 255 (type locality, Quintana, near Popayán, Cauca).

Diagnosis.—Resembles *Phyllobates chocoensis* and *P. bocagei* in having a thickset body, a short, broad snout, and an indistinct light diagonal stripe—or traces of such a stripe—across the side to the groin. Differs from these and from all other Colombian species of *Phyllobates* in having a very short tibia (between 35 and 42 percent of the total length) with the heel reaching a point between eye and posterior border of tympanum.

Description.—CNHM 54456 (holotype), an adult female from Quintana, near Popayán, Cauca, Colombia. Tongue half as wide as mouth opening, oval, its posterior border free and slightly notched; snout broadly rounded when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout three-quarters their distance from eye. Canthus rostralis bluntly rounded; loreal region faintly concave, sloping outward to the upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital distance 1½ times that of upper eyelid, a little greater than interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to three-quarter its own diameter. Fingers fairly long, with lateral ridges, free, first finger equal to second, fourth longer than either and reaching to base of penultimate phalanx of third, the disk of which covers about one-eighth the tympanum; a small oval thumb pad present; a large round palmar callus; metacarpal tubercles well developed. Toes moderate in length, webbed at the base, third toe much longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; disk of fourth toe about one-third the tympanum and larger than that of third finger; a small oval inner metatarsal tubercle and an outer one of about equal size; a faint tarsal ridge ending diagonally across tarsus midway to heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of tympanum; when limbs are laid along the side, knee and elbow just meet; when hind legs are bent at right angles to body, heels are widely seperated. Skin of upper parts resistant to abrasion, smooth (thickly pustular under the lens); a small parotoid swelling extending backwards as a narrow lateral gland, fading out at midbody but again perceptible near the groin; venter smooth (finely pustular with magnification); no skinfold across the chest; a faint ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 30.5 mm.; head length, 9 mm.; head width, 10.5 mm.; femur, 12.5 mm.; tibia, 11.5 mm.; foot, 11.5 mm.; hand, 7.5 mm.

Color in alcohol.—Dorsum seal brown, with some very indistinct irregular darker spots on each side of midline, and with traces of dark bars across upper surfaces of thigh and shank; side of head seal brown; tympanum fawn color; edge of lip slightly paler than side of head, with a faint irregular darker stripe above the lip border; an ecru drab crescent in front of arm insertion and in axilla; upper arm chocolate above, this area bordered by darker brown and sharply set off from the paler fawn color of the lower surface of the arm; side seal brown, the lateroventral border very irregular, with a small light drab spot in front of groin but no definite light line; a few pale spots near the swollen glandular area just above the groin; venter ecru drab with a coarse seal brown reticulation over chin, chest, and belly; lower thigh with a pale drab area on proximal half and with fine seal brown reticulations over the remainder; lower surfaces of shank, foot, and inner arm immaculate ecru drab; outer limb surfaces seal brown; palms of hands and soles of feet seal brown, the disks, tubercles, and webs ecru drab.

Specimens Examined

COLOMBIA

Cauca: Quintana, near Popayán, CNHM 54456 (holotype), and CNHM 44041, 44045–6, 54341, 54428, USNM 147228–9 (all paratypes); near Popayán, CNHM 44042–3; Puracé, USNM 151180–2.

Phyllobates thorntoni, new species

Plate 8d–f

Holotype.—AMNH 1347, an adult female from Medellín, Antioquia, Colombia, collected by R. D. O. Johnson.

Paratypes.—AMNH 1363, 1370, 1375, 38806–7, USNM 147511, all from Medellín, Antioquia; AMNH 14016, 14020, USNM 147512, all from Andes, Antioquia; CNHM 63889–90, 818778, USNM 147227, MLS 163, 163a–b, all from Yarumal, Antioquia.

Diagnosis.—Toes one-third webbed; sides seal brown in alcohol, without any light dorsolateral or diagonal stripes; belly with dark spots and reticulations on a light ground; adpressed heel usually reaching to between eye and nostril, occasionally to posterior border of eye; skin resistant to abrasion; size to 32.5 mm.

The absence of any light dorsolateral stripe or light diagonal stripe crossing the dark area in front of the groin places the new species close to *Phyllobates bicolor* and *P. chocoensis*. It is distinguished from *bicolor* by its webbed toes, and from both *bicolor* and *chocoensis* by its notched tongue and other features.

Description of holotype.—Tongue a little more than half as wide as mouth opening, oval, its posterior border free and very slightly notched; snout nearly truncate when viewed from above, broadly rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis distinct; loreal region vertical and nearly flat, sloping down to the upper lip. Eye large, prominent, its diameter 1½ times its distance from tip of snout; interorbital diameter equal to that of upper eyelid, a little less than interval between nostrils. Tympanum distinct, its greatest diameter about one-third that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers moderate, with large disks, with lateral ridges, free, first finger shorter than second, which is equal to fourth, both of these reaching to base of penultimate phalanx of third, the disk of which covers about one-third the tympanum; a small oval thumb pad present; a round palmar callus; metacarpal tubercles scarcely developed. Toes one-third webbed, rather short, third toe longer than fifth, its disk fairly large, reaching to base of penultimate phalanx of fourth; disk of fourth toe covering nearly one-half the tympanum and larger than that of third finger; a weak, oval inner metatarsal tubercle and a smaller oval outer one; no definite tarsal ridge; a pronounced skinfold on heel and knee. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to center of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts resistant to abrasion, smooth (minutely pustular under the lens); venter smooth; no glandular ridge above tympanum; no skinfold across the chest; no external vocal sacs in the male.

Dimensions.—Head and body, 27 mm.; head length, 9 mm.; head width, 9 mm.; femur, 12 mm.; tibia, 12 mm.; foot, 10 mm.; hand, 7 mm.

Color in alcohol.—Dorsum seal brown, the dorsolateral region a slightly paler color; side of head and body also seal brown, becoming wood brown on upper lip where some pale spots of wood brown appear in the darker area; sides seal brown, merging irregularly with the tawny-olive ventral color and lacking a light diagonal dorsolateral stripe; throat faintly marbled with olive; belly with dark sepia spots and reticulations on the tawny-olive ground; chest and lower femur tawny-olive with scarcely any dark spots; upper femur, tibia, and forearm with seal brown crossbars; knee olive; soles of feet and palms of hands tawny-olive. No evidence of any well-defined black or white lateral stripes.

Remarks.—This frog has a proportionately longer femur than any others of its genus in Colombia except *Phyllobates bicolor* (with which the critical measurement overlaps very slightly—the critical range in *P. thorntoni* being from 46.7 to 49.7 percent, and in *bicolor* from 46.1 to 46.8 percent). The heel reaches between the center of eye and the nostril in all but one example, in which it reaches to the posterior corner of the eye. The belly appears smooth at first glance, but under the lens is seen to be pustular, and in one specimen it is faintly granular. In adults the belly is heavily spotted or reticulated, and sometimes three or four large light spots appear on the side of the belly well below the groin. Often the chin and chest are spotted.

The largest example (AMNH 14016), a female containing eggs, measures 32.5 millimeters in length.

It is appropriate to dedicate this species to Dr. Wilmot A. Thornton, whose Colombian collections have aided greatly in the present study.

Phyllobates chocoensis (Boulenger)

PLATE 9A–B

1912. *Hylixalus chococnsis* Boulenger, p. 190 (type locality, Río San Juan, Chocó, Colombia).
1944. *Hyloxalus chococnsis.*—Dunn, 1944c, p. 519.
1963. *Prostherapis chocoensis.*—Gorham, 1963, p. 25.

Description.—BM 1929.2.1.5, an adult from south of Santa Bárbara, Antioquia, Colombia. A pair of weak bony ridges on top of head. Tongue almost two-thirds as wide as mouth opening, oval, its posterior border free and unnotched; snout nearly truncate when viewed from above, truncate and sloping slightly backward in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis curved, rather blunt; loreal region vertical, flat, merging gradually with the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum distinct anteriorly, less so posteriorly, its greatest diameter about one-third that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers moderate, with lateral ridges and rather large disks, free, first finger shorter than second, fourth longer than either and reaching almost to base of disk of third, which covers nearly half the tympanum; a very small oval thumb pad present; a large heart-shaped palmar callus; metacarpal tubercles well developed. Toes moderate, one-half webbed, third toe a little longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering about half the tympanum and approximately equal to that of third finger; a distinct oval inner metatarsal tubercle and a smaller rounded outer one; a sharp tarsal ridge, ending diagonally halfway to heel; a distinct skinfold on heel and knee. Body rather stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches anterior corner of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts finely pustular or shagreened, with numerous irregular fine glandular ridges; skin normal, not easily torn; venter pustular with a few fine glandular ridges on posterior half; no glandular ridge behind eye; a pair of indistinct wide dorsolateral ridges, with some elongate lateral tubercles on sides and below angle of jaw; no skinfold across the chest; a distinct ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 27.5 mm.; head length, 10 mm.; head width, 10 mm.; femur, 13.5 mm.; tibia, 13 mm.; foot, 10.5 mm.; hand, 8 mm.

Color in alcohol.—Dorsum and lateral regions slate-gray, with a large indistinct olive-gray spot behind each eye continuing along the back almost to sacrum, and forming with its fellow an indistinct)(mark; lateral tubercles pale drab gray; tops of legs and arms with a very wide slate-gray bar and one or two narrower and lighter ones on a pale olive-gray ground; a pale gray axillary spot; upper lip slate, with a narrow light edge and three or four small white spots near the margin, the last one below and behind the eye; throat and chest olive-buff; lower surfaces of arms and legs deep ochraceous-buff; a fine gray network pattern on throat and chest, becoming much coarser on belly; lower surfaces of legs and arms with indistinct traces of a similar gray network; posterior femur dull ochraceous buff, with narrowed prolongations of the dark crossbars and indistinct gray reticulations. Webs between toes white. No light vertebral or dorsolateral lines. The other adult at hand (BM 1929.2.1.3) has only two small white spots on the upper lip. The large white axillary spot is very distinct, however, and is continued in lessened brilliance on top of the arm. The dark dorsal areas here appear as two coarse chevron marks, their points nearly meeting. No light vertebral line is visible in the two adults or in the two immature frogs (BM 1929.2.1.4, 1929.2.1.6).

Remarks.—According to the critical measurements, the width and length of head as compared to length of body are greater in *Phyllobates chocoensis* than in *P. inguinalis* or *P. thorntoni.*

Boulenger was right in considering his "*chocoensis*" allied to *bocagei* Espada, as the two appear very similar at first glance. The snout of *chocoensis* seems wider, and this fact is borne out by the interorbital diameter, which is 1½ times the width of the upper eyelid in *chocoensis* and is equal to it in *bocagei.* The minute white spots on the upper lip of *chocoensis* seem to be absent in *bocagei;* otherwise the patterns of both species are very similar. The first finger is a trifle shorter than the second in *chocoensis,* while these two fingers are equal in in *bocagei*; also the third toe is a little longer than the fifth in *chocoensis,* subequal in *bocagei.* The degree of webbing between the toes is a full half in *chocoensis,* while it seems less in *bocagei* and the margin of the web between the toes appears more deeply incised. The heel reaches to the anterior eye in the four examples of *chocoensis* from Santa Barbara, Antioquia, although it was said to reach the tip of the snout in the unique type of the latter. In the Ecuadorean *bocagei* the heel extends to "in front of eye."

Apparently these two species are not closely related to *P. palmatus*, in spite of the three having about the same degree of webbing between the toes. Unlike *palmatus*, with its easily torn skin, both *chocoensis* and *bocagei* appear to have abrasion-resistant skins that hold up well under the ordinary vicissitudes of collecting, preserving, and shipping. The abrasion-resistance of skin appears to be a useful character for separating other web-toed species from *palmatus*, although it has not been noticed heretofore. So far, *bocagei* appears to have been recorded only from Ecuador, but it would not be surprising to find it in one of the southernmost states of Colombia.

When grouped with species having an abrasion-resistant skin combined with the absence of light lines on the side and back, *chocoensis* comes nearest to *bicolor* and *thorntoni*. As noted elsewhere, it is separated from *bicolor* by having its toes one-half webbed, and from *thorntoni* by having its tongue entire, as well as by other characters.

Specimens Examined

COLOMBIA

Antioquia: South of Santa Barbara, BM 1929.2.1.3–6.

Phyllobates brunneus **(Cope)**

Plate 6d–f

1887. *Prostherapis brunneus* Cope, 1887a, p. 54 (type locality, "Chupada" [=Chapada], 30 mi. northeast of Cuiabá, Mato Grosso, Brazil).
1918. *Dendrobates ranoides* Boulenger, p. 428 (type locality, Villavicencio, Colombia).
1920. *Phyllobates brunneus*.—Barbour and Noble, 1920, p. 401.—Lutz and Kloss, 1952, p. 673.—Cochran, 1955, p. 14.—Dunn, 1957, p. 77.—Ginés, 1959, p. 134.—Rivero, 1961, p. 166; 1964a, p. 304; 1964b, p. 311.—Gorham, 1963, p. 25.
1922. *Phyllobates subpunctatus* (not of Cope).—Ruthven, 1922, p. 49.
1923. *Hyloxalus beebei* Noble, 1923a, p. 280 (type locality, near Kaieteur Fall, British Guiana); 1931, p. 36.
1925. *Eupemphix olfersiodes* A. Lutz, 1925, p. 138 (type locality, littoral of the state of Rio de Janeiro, Brazil).
1941. *Phyllobates peruvianus* Melin, p. 61, fig. 34 (type locality, Roque, Peru).
1945. *Phyllobates intermedius* Andersson, p. 5, fig. 2 (type locality, Río Pastaza, eastern Ecuador).

Description.—USNM 146907, an adult from Villavicencio, Meta, Colombia. Width of tongue about three-fourths that of mouth opening, spatulate, with a very slight indentation on its free posterior border; snout quite short, broadly rounded at the tip when seen from above, nearly vertical and slightly rounded in profile, the upper jaw extending well beyond the lower; nostrils lateral, projecting, just below the canthal angle, their distance from end of snout about one-half their distance from eye, separated from each other by an interval equal to 1½ times their distance from eye. Canthus rostralis distinct and fairly sharp-edged; loreal region flat, with only a slight transverse channel along its lower border, the upper lip almost in the same plane with it, and vertical. Eye very large and prominent, its diameter 1¼ times its distance from end of snout; interorbital diameter equal to that of upper eyelid but only two-thirds the distance between the nostrils. Tympanum fairly distinct, at least on its anterior and lower edges, its greatest width about one-half the diameter of eye and located immediately behind eye. Fingers long, free, not ridged, with distinct disks; disk of third finger covering one-fourth the tympanum; first finger slightly longer than second, fourth nearly as long; subarticular tubercles of fingers large but not very sharply defined; a large indistinct palmar callus; toes faintly webbed, scarcely ridged laterally, their disks well developed, disk of fourth toe a little larger than that of third finger and equaling nearly one-half the diameter of the tympanum; third toe much longer than fifth, reaching halfway on antepenultimate phalanx of fourth; a short tarsal ridge extending from base of inner metatarsal tubercle and ending in a diagonal gland across the tarsus midway to heel; a small inner and a very small outer metatarsal tubercle; subarticular tubercles of toes smaller but a little more distinct than those of fingers. No inguinal or lumbar gland. Body fairly elongate, in postaxillary region a trifle narrower than greatest head width. When hind legs are adpressed, heel reaches anterior corner of eye; when limbs are laid along the side, knee and elbow greatly overlap; when hind legs are bent at right angles to body, heels just touch. Skin heavily pustular above, with a few weak tubercles in the lumbar region, and rather easily torn; a small protuberance of skin above the anus; a slight ridge behind the tympanum; venter entirely smooth except for postanal granules; no ventral disk. No external vocal sacs apparent in the male, but a slight longitudinal wrinkling of the skin on either side of the throat below the jaw commissure; this area suffused with pale grey.

Dimensions.—Head and body, 22.5 mm.; head length, 7.5 mm.; head width, 7 mm.; femur, 9 mm.; tibia 10.5 mm.; foot, 9 mm.; hand, 5.5 mm.

Color in alcohol.—Dorsum dull heliotrope purple; a sepia lateral stripe beginning at tip of snout, passing through loreal and tympanic regions, widening on the sides and continuing to the groin; a whitish area sharply contrasting with and defining the upper and lower borders of this dark stripe; indistinct sepia markings between the eyes and down center of back; anterior femur with a dark stripe, set off by a white area below; posterior femur with a less-defined light stripe; several dark diagonal crossbars on upper surfaces of femur, tibia, and foot; a sharp dark line along posterior surface of arm, with dark irregular spots on upper arm surface; lip white, sharply outlining the dark stripe above it; venter white, immaculate (in this example) except for a few small spots across the throat, on lower posterior femur, below knee, and on foot. Soles of feet and palms of hands pale sepia, the disks darker below.

Remarks.—The skin on back and belly may be strongly or weakly granular, but some specimens are entirely smooth below. The toes may be faintly webbed at the base, or the webbing may be rather conspicuous, extending about one eighth the length of the free part of the fourth toe. The heel reaches to the center or the posterior corner of the eye in most examples at hand and to the anterior corner of the eye in several; it reaches to the nostril in one specimen.

The skin tears rather easily, although not as easily as that of *Phyllobates palmatus.* While *P. brunneus* and *P. palmatus* are near each other in the key, they are readily separated by the much greater webbing of the toes in *palmatus* and the relatively shorter femur and hand in *brunneus.* Also, the full-grown *brunneus* does not appear to exceed 22.5 millimeters and *palmatus* grows to a length of 36.5 millimeters.

Dunn (1957) likened *brunneus* to *talamancae,* a Costa Rican species which, he stated, has appeared in Colombia at Popayán, in Cauca, and at El Centro, in Santander. He noted that "in both frogs the white dorso-lateral stripe is entirely above the dark lateral band, and runs from the eye to the sacrum." The present authors have not found any specimens of *talamancae* in Colombia so far; hence, that species is not included in this study.

Because of the traces of webs between the toes and of many other similarities, it seems reasonable to call the very prolific and wide-ranging little frog found from Panama to Nariño, Colombia, by the name of *brunneus* (Cope) instead of *latinasus* Cope, the original description of which states distinctly that the toes are free. Furthermore, the size of the type of *latinasus* was given as three centimeters (30 mm.), while the maximum size among the 206 examples that were measured for the present study and that here are called *brunneus* is 28.5 millimeters. Although this difference is not great, it is of some significance when considered along with other facts regarding *latinasus.* The type of *latinasus* has been missing since Cope's time, and fresh topotypic material that might be considered as representing this species is scarce.

Considerable variation is noted in the ventral coloring of *brunneus* as here understood. Sometimes the entire throat, chest, and belly are immaculate pale yellow or olive; often, however, some fine dark spots occur on the chin, and sometimes dark dots extend over most or all of the ventral surfaces.

In *femoralis*, a species of about the same size that might be confused with *brunneus*, the entire chin, chest, and anterior half of belly are solid black, while dark spots on a light ground occur only on the posterior half of the belly and on the lower surfaces of the limbs. *P. boulengeri*, the other species with a dark-spotted venter, has much larger black spots all over the lower surfaces, concentrating on the throat around a light longitudinal median area with large, irregular black patches on either side of it.

P. brunneus resembles *latinasus* considerably in color and general appearance, but its head is proportionately a little shorter and narrower, its foot is much longer, and its hand is slightly longer. Also, *brunneus* apparently is larger.

The white (yellow in life) stripe that starts behind the eye (or sometimes on the canthus) in *brunneus* begins to curve downward when it reaches the sacrum and goes diagonally across the dark lateral stripe to the anterior surface of the femur, often enlarging to a definite light spot in the upper part of the groin. In *latinasus* this light line is said to continue parallel to the dark stripe without crossing it—both becoming diagonal on the side—and sometimes extends on the upper proximal part of the femur as a light bar. Occasionally a thin light stripe commences at the middle of the wide dark lateral stripe and continues straight back to the groin, and sometimes a third light stripe bounds the lower edge of the dark lateral stripe at the lateroventral area in *latinasus*. Such markings are absent or indefinite in *brunneus*.

Specimens Examined

COLOMBIA

Antioquia: Medellín, MCZ 7778–7802, ANSP 24112–35, MLS 162; Puerto Berrio, CNHM 30808; Yarumal, CNHM 63856.

Boyacá: San Mateo, USNM 152320–32, MLS 139, 139b.

Caldas: La Selva, Pueblo Rico, CNHM 54343, 54496–9, 54501–6, 54509–26, 54528–41, 54543, 57411; Laguneta, near Salento, CNHM 43997, 44079; ANSP 25353–63; 20 km. south-southeast of Manizales, 2,860 m., USNM 146466; Pueblo Rico, San Juan slope, MCZ 2891, 5006–7; BM 1910.7.11.46–50, 1932.10.2.77–8; Villa Maria, USNM, 146860–2; Zuaraza, CNHM 54491–5.

Caquetá: Aserrío, USNM 146867–71.

Cauca: El Tambo, Cauca River, 5,100 ft., ANSP 25379–82; Huisito, CNHM 54545–63, 54565–7; Moscopán, ANSP 25383–7; Munchique, CNHM 4336, 54420–1; Popayán, CNHM 54542–4; Quintana, near Popayán, CNHM 44001–8, 44010–28, 44030–40, 44044, 54339, 54422–7, 54429–55, 54486; Río San Juan, CNHM 54345.

Chocó: Andagoya, CNHM 81858–9; Pizarro, CNHM 54457.

Cundinamarca: North of Albán, USNM 150720–1.

MAGDALENA: Finca La Granja, road to San Lorenzo, 2,300–2,700 m., USNM 150761; Magdalena Forest, BM 1929.2.1.2; San Lorenzo, Santa Marta Mountains, CAS 54736.

META: Buenavista, USNM 150169; Serrania de La Macarena, CNHM 81365; Villavicencio, CNHM 81811–5, USNM 118718–9, 146904–20, 150170, MLS 410.

NARIÑO: Guitarilla, CNHM 54198, 54342, 54458–64, 54466–71, 54473, 54475–7, 54479, 54481, 54483; La Guayacana, CNHM 61787–8, 61820, 61824–5; Túquerres, CNHM 54185, 54484–5, 54487–90.

ECUADOR: Quimbo, BM 98.3.1.4–7.

PANAMA: Cana, Darién, USNM 54231, 63005, 66318; Cerro Azul, USNM 54174.

***Phyllobates palmatus* Werner**

PLATE 9C–E

1899. *Phyllobates* (*Hypodictyon*) *palmatus* Werner, p. 478 (type locality, Fusagasugá, near Bogotá, Cundinamarca, Colombia).

1919. *Hylixalus granuliventris* Boulenger, 1919b, p. 81 (type locality, Bogotá, Cundinamarca, Colombia).

1920. *Syrrhophus palmatus.*—Barbour and Noble, 1920, p. 401.

1939. *Hyloxalus granuliventris.*—Hellmich, 1939, p. 536.—Dunn, 1944a, p. 79; 1944d, p. 398, fig. 1; 1957, p. 77.

1944. *Hyloxalus palmatus.*—Dunn, 1944a, p. 79; 1944b, p. 403; 1944c, p. 519.

1957. *Prostherapis palmatus.*—Dunn, 1957, p. 77.—Stebbins and Hendrickson, 1959, p. 512.—Gorham, 1963, p. 25.

1957. *Prostherapis granuliventris.*—Dunn, 1957, p. 77.—Stebbins and Hendrickson, 1959, p. 512.

Description.—USNM 146899, an adult from Buenavista, Meta, Colombia. Tongue cordiform, two-third as wide as mouth opening, oval, its posterior border free and deeply notched; snout straight-sided, its tip bluntly rounded when viewed from above, rounded in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, projecting, their distance from end of snout equal to one-half their distance from eye. Canthus rostralis rounded; loreal region flat, its lower margin deeply concave before it joins the vertical upper lip. Eye large, prominent, its diameter nearly equal to its distance from tip of snout; interorbital diameter about 1⅓ times that of upper eyelid, a little less than interval between nostrils. Tympanum fairly distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderately long, free, with lateral ridges, first and second fingers subequal, fourth finger longer than either and reaching midway on penultimate phalanx of third; disk of third finger covering about one-third the tympanum; a small oval thumb pad present, a larger round palmar callus; metacarpal tubercles well developed. Toes moderately long, half-webbed, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; disk of fourth toe covering about one-third the tympanum and approximately equal to disk of third finger; a distinct oval inner metatarsal tubercle and a smaller round outer one; a heavy tarsal ridge, ending diagonally across tarsus about two-thirds the distance from metatarsal tubercle to heel; a heavy skinfold on heel and knee. Body very stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts delicate and very easily torn, smooth, with some heavy pustules along the sides and on proximal parts of upper femur; throat and chest minutely pustular, the pustules changing to fine granules on posterior part of belly; a few coarser granules on lower femur; a glandular swelling from posterior corner of eye above tympanum, ending above shoulder; no skinfold across the chest; no ventral disk; a pair of lateral external vocal sacs in the male. Dorsal skin so loose that it can be rubbed to resemble longitudinal dorsal folds, which probably do not occur in life. A pair of lateral vocal sacs and sometimes a widening of the third finger to form a "flange" in the males.

Dimensions—Head and body, 36.5 mm.; head length, 12 mm.; head width, 13.5 mm.; femur, 17 mm.; tibia, 17.5 mm.; foot, 15.5 mm.; hand, 10 mm.

Color in alcohol—Dorsum fawn color, with moderately large irregular sepia spots scattered over it; a narrow wavy sepia interorbital band, and a transverse irregular spot across snout behind nostrils; upper limb surfaces drab with irregular wood brown cross bars; posterior femur drab with a coarse sepia reticulation; anterior femur and entire venter immaculate ecru drab; side of head fawn color, with the exception of a wide sepia stripe from tip of snout to anterior eye, a trace of which appears behind eye and for a short distance along sides; no light diagonal stripe on side; outer surfaces of feet and hands ecru drab, with faint sepia spots; palms of hands and soles of feet ecru drab, their disks and tubercles pale sepia.

Remarks—The dorsal skin is extremely fragile and tears readily; consequency, few preserved specimens come out of the collector's tin in perfect condition. This character may prove to be of value in suggesting relationships, as it occurs also in other species somewhat similar to *P. palmatus* in structure and appearance.

Over its wide range, from the north to the south of Colombia and from east of the Eastern Cordillera to the valley between the Central and the Western Cordilleras, a considerable variation in the critical measurements would have been expected. On the contrary, this species is remarkably stable, as it varies only from 4.8 to 5.5 millimeters in the six measurements that were taken on 105 individuals.

The species is quite easy to recognize, for preserved examples are ragged-looking because of the usually torn skin and often are dark colored, with little of the delicacy of form or pattern found in *latinasus*, *brunneus*, and some of the other forms in the genus. The toes are one-third to one-half webbed in nearly all examples of *palmatus*, and the web is conspicuous because of its paler color between the dark toes. The posterior half of the belly is granular, often finely or faintly so.

In about 70 percent of the examples measured the adpressed heel reaches to the center or anterior border of eye, in 15 percent it reaches to a point between eye and the tip of the snout, and in the remaining 15 percent it reaches to a point between shoulder and posterior corner of eye.

Adult males have a dark gray or black throat, and sometime there is a short longitudinal fold down each side of the throat, giving evidence of a pair of lateral vocal sacs. The third finger showed a "flange" in only two males (CNHM 61176, 61180) both from Catival, upper Río San Jorge, Bolívar.

Metamorphosis often takes place when the young are some 15 millimeters in length. UNMS 145030 from Buenavista, Meta, is 15 millimeters long and has no trace of a tail. Its arms and legs are like those of an adult, and its mouth is nearly so. In another 15-millimeter example (USNM 145028), from the same place, a tail measuring 8.5 millimeters still remains, and the mouth is not yet that of an adult, although the limbs are fully formed. But CNHM 61823 from Alto de Quimari, Bolívar, measuring only 12.5 millimeters, has no trace of a tail, and has well-developed limbs and mouth; hence, the developmental rate in different individuals may differ considerably.

The body color in most preserved adults is a fairly uniform dark purplish brown, but often the lighter individuals show the wide darker dorsal chevrons and three wide dark crossbands on femur, tibia, and outside of foot. The torn places in the skin are white, and at a short distance they may give the quite misleading appearance of a light-spotted animal. Some examples have a pale stripe beginning above the shoulder as a narrow light line but widening as it goes diagonally downwards to the front of the groin, and sometimes breaking up into several short pale spots. This light stripe may have been orange or yellow in life. Some frogs lack the light lateral stripe, but usually there is at least one small pale spot just in front of the groin.

Specimens Examined

COLOMBIA

Amazonas: Puerto Nariño, MLS 23.

Antioquia: Caldas, USNM 150693; Yarumal, USNM 146857–9.

Atlántico: Barranquilla, USNM 118228. (This locality record has been questioned by Dunn).

Bolívar: Alto de Quimarí, CNHM 61771, 61783–5, 61821–3; Catival, upper Río San Jorge, CNHM 61176–80.

Caquetá: Florencia, USNM 146874–5.

Cundinamarca: Aguadita, AMNH 22610–5; Arracachal, Planta Eléctrica del Salto Tequendama, USNM 145032–47; Bogotá, AMNH 13472–3; Choachí, USNM 118720; AMNH 20425–33, 20436–7; Finca El Cuchero, 350–500 m., near Tocaima, USNM 150187–93; Fomeque, AMNH 20409–18; Monte Redondo, USNM 137773–86, 145055–7; Páramo de Verjon, east of Bogotá, AMNH 20364–9, 20372–3; Quetame, USNM 144998–5004; Sabana de Bogotá, 2,200–2,500 m., on road between Sibaté and Aguadita, USNM 150195–8; Santander, 1,700 m., USNM 150194; Santandercito, USNM 146840–2 (juv.); Tequendama Falls, USNM 146893–7; below Tequendama, USNM 145048–52; below Tequendama Falls, just off edge of Bogotá savannah, USNM 146634. Volcanes, Caparrapí, USNM 145053–4; east base of cordillera and extreme limit of llanos, ANSP 24322–3; west of Albán, 2,000 m., CNHM 132987.

Meta: Buenavista, USNM 146898–903, 145016–31, 150199–250; Camp Las Ranas, La Macarena, USNM 145005–15; La Macarena, above Camp 1, 300 m., USNM 150251.

Nariño: La Guayacana, CNHM 61776.

Norte de Santander: La Selva, USNM 147132–4, MLS 224.

Santander: Mogotes, MLS 153; Quebrada La Lechera, Vélez, USNM 145059–71; San Gil, USNM 146937–8, MLS 136.

Tolima: Guandalay, MLS 281, 281a; Honda, AMNH 20359–63.

***Phyllobates pratti* Boulenger**

Plate 11g–i

1899. *Phyllobates pratti* Boulenger, p. 274, p. 11, fig. 3 (type locality, Santa Inés, north of Medellín, [Antioquia,] Colombia, 3,800 ft.); 1913, p. 1026.—Barbour and Noble, 1920, p. 399.—Breder, 1946, p. 407.—Taylor, 1952, p. 643.—Dunn, 1957, p. 78.—Gorham, 1963, p. 25.

1924. *Phyllobates latinasus* (not of Cope).—Dunn, 1924 (part), pp. 5–7, 9–10 (specimens from Santa Cecilia, Costa Rica, and Panama); 1931, pp. 389, 391.

Description.—BM 1914.5.21.77, an adult female from Peña Lisa, Condoto, Chocó, Colombia. Tongue half as wide as mouth opening, oval, its posterior border free and unnotched; snout very broadly rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis straight, prominent; loreal region vertical, slightly concave, a short furrow between it and the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, a little greater than interval between nostrils. Tympanum distinct, its greatest diameter about half that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers long, with lateral ridges and small terminal disks, free, first finger much longer than second and equal to third, second and fourth subequal and reaching base of penultimate phalanx of third; an oval thumb pad present; a large rounded palmar callus; metacarpal tubercles well developed. Toes fairly long, slightly (about one-eighth) webbed, and their disks small, third toe much longer than fifth, disk of third reaching to base of antepenultimate phalanx of fourth; a small round metatarsal tubercle and an outer one of equal size; a small tubercle on tarsus midway to heel; no apparent tarsal ridge; a heavy skinfold on heel and knee. Body elongate, in postaxillary region less than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels are narrowly separated. Skin of upper parts rather easily torn, smooth (faintly pustular under the lens); venter smooth; a distinct glandular dorsolateral ridge from posterior corner of eye, above tympanum, ending at groin, and another such ridge below it, both following the light longitudinal stripes; a skinfold across the chest; a weak ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 18 mm.; head length, 7 mm.; head width, 6.5 mm.; femur, 7.5 mm.; tibia, 8.5 mm.; foot, 6.5 mm.; hand, 5 mm.

Color in alcohol.—Dorsum immaculate Mars brown; a white (yellow in life) dorsolateral longitudinal line commencing behind eye and extending straight back to the upper part of the groin, where it merges with the light buff upper surface of the femur; a clove brown band beginning at tip of snout, continuing on loreal region, widening behind the eye and along the side to groin; a light stripe along upper lip; venter, including chin and chest, immaculate pale olive-buff, with a wavy but sharp demarcation between it and the clove brown lateral band; upper part of femur pale, nearly immaculate; posterior femur buff, with a large oval sepia spot from its midpoint to behind the knee, and with a few lighter spots behind anus and extending along lower femur to knee; upper part of tibia, foot, and forearm pale wood brown with darker bars and spots; soles and palms drab with indistinct darker marblings.

Remarks.—The validity of this species is still doubtful, as further observations on the significance of direction in the light lateral stripe are needed. Most examples of *Phyllobates* that could be related to *P. pratti* have this stripe dropping diagonally across the side to the lower part of the groin, but a few frogs, resembling the examples of *pratti* from the British Museum, have this stripe going straight back from above the shoulder so that it ends above the hind leg insertion.

Barbour (Barbour and Noble, 1920, p. 399) persuaded Boulenger that *pratti* should be synonymized with *latinasus*, but a comparison of Boulenger's material of the former with freshly collected specimens of the latter shows that there is slight difference between the two. For the present, it seems advisable to retain Boulenger's name.

Specimens Examined

COLOMBIA

Chocó: Noanama, BM 1909.10.30.39; Novita, Río Tamana of Río San Juan, BM 1910.7.11.45; Peña Lisa, Condoto, 300 ft., BM 1913.11.12.80, 1914.5.21.77; Río San Juan, 10 km. west of Playa de Oro, USNM 147208–9.

Phyllobates latinasus **Cope**

Plate 10g–i

1863. *Phyllobates latinasus* Cope, p. 48 (type locality, Truando River, New Granada); 1866, p. 130.—Boulenger, 1898a, p. 119.—Barbour and Noble (part), 1920, p. 399.—Dunn, 1924, pp. 2, 5; 1957, p. 78.—Griffiths, 1954, p. 41.—Gorham, 1963, p. 25.

1866. *Colostethus latinasus* Cope, 1866b, p. 130.—Boulenger, 1898a, p. 119.

1874. *Colostethus latinosus*.—Cope, 1874b, p. 131.

Description.—USNM 150716, an adult from Montañita, Caldas, Colombia. Tongue nearly two-thirds as wide as mouth opening, oval, its posterior border free and unnotched; snout very broadly obtuse when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-fourth their distance from eye. Canthus rostralis rounded; loreal region flat, vertical, flaring outwards to the upper lip. Eye large, prominent, its diameter about four-fifths its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, narrower than interval between nostrils. Tympanum distinct, its greatest diameter about half that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers long and slender, with lateral ridges, faintly webbed at the base, first finger a little longer than second, fourth longer than either, reaching to base of penultimate phalanx of third, the disk of which covers about one-fourth the tympanum; a small oval thumb pad present; a larger round palmar callus; metacarpal tubercles well developed. Toes long, distinctly webbed at base, third toe longer than fifth, its disk reaching to base of penultimate phalanx of fourth; disk of fourth toe covering one-fourth the tympanum and equal to that of third finger; a small oval inner metatarsal tubercle and a smaller round outer one; a short, sharp tarsal ridge, ending diagonally halfway to heel; a distinct skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts easily abraded, pustular anteriorly, with large conical tubercles on sacrum and upper surfaces of legs; venter smooth (minutely pustular under the lens); a swelling behind posterior corner of eye above tympanum; a weak skinfold across the chest; no ventral disk; apparently no external vocal sacs in the male.

Dimensions.—Head and body, 26 mm.; head length, 9 mm.; head width, 8 mm.; femur, 11 mm.; tibia, 12 mm.; foot, 10.5 mm.; hand, 7.5 mm.

Color in alcohol.—Dorsum clove brown; a black lateral stripe beginning at tip of snout, continuing on loreal region, widening behind eye, and dropping obliquely to groin, outlined above by a seal brown dorsolateral stripe which lightens at midbody to white (yellow in life); anterior femur with a clove brown stripe, and above it a semilunar pale spot from the groin halfway to knee; remainder of anterior femur sepia, with an irregular row of black spots preceding a white stripe on posterior femur, edged below by sepia spots; venter pale buff, immaculate except for a black line around lower jaw and a patch of dark dots below shoulder; upper lip cream buff below the black lateral stripe, powdered with small sepia dots; lower surfaces of hands and feet slate-gray, the disks and tubercles a little darker. A narrow, irregular white line goes forward along the side from the groin.

Remarks.—With Cope's wholly inadequate description, the faded and softened condition of the type specimen from Truando at the time of description, and the present lack of freshly collected material from the type locality, it is very difficult to identify any frog positively as *Phyllobates latinasus.* Even the example chosen for the preceding redescription does not agree entirely with the earlier conceptions of Barbour, Boulenger, and Dunn as to what *latinasus* really might be. Although Cope states that his example had an oblique white line from the femur along the side, below the dorsolateral stripe, Barbour and Noble (1920, p. 399) believed *latinasus* to be conspecific with Boulenger's *pratti,* in which the light dorsolateral stripe continues straight back to the groin, with a short parallel white stripe along the side from groin forwards nearly to axilla, as shown in the figure of *pratti* (Boulenger, 1899, p. 274, pl. 11, fig. 3). Four examples that do have the non-oblique dorsolateral line and the short, straight parallel lateral line have come to light; these are from Chocó, Valle, and Nariño, Colombia.

The foot of *latinasus* averages proportionately shorter than that of any other Colombian species of *Phyllobates,* although a graph of critical measurements indicates a slight overlapping with that of *mertensi.*

The upper femoral surface of *latinasus* tends to be pale, and very slightly mottled, if at all, but on the posterior surface is a sharply marked, wide black stripe ending at the knee, and below that stripe is a wide white stripe that begins at the groin, crosses the upper proximal part of the femur, and also ends at the knee. This light stripe is bordered below by a very irregular dark stripe that breaks into small and large spots on the lower inferior part of the femur.

A comparison of this species with *brunneus* shows in general, a close resemblance.

Specimens Examined

COLOMBIA

Antioquia: Sonson, MCZ 16083–8; Medellín, MCZ 7778–802, ANSP 24112–35, MLS 162; Yarumal, CNHM 63856.

Caldas: Pueblo Rico, 5,200 ft., BM 1910.7.11.46–50; San Juan, Pueblo Rico, 3,300 ft., BM 1932.10.2.77–8, MCZ 2891, 3893, 6006–7; Laguneta, 8,000 ft., Cauca River side, ANSP 25353–63, CNHM 43997, 44079; La Selva, Pueblo Rico, CNHM 54496–9, 54501–6, 54509–11, 54543; Zuaraza, CNHM 54491–5; 20 km. south-southeast of Manizales, 2,860 m., USNM 146466; Pacora, MLS 391; Montañita, USNM 150716–7. [Tentatively identified: Montañita, USNM 150715; nine km. east of Santa Rosa, USNM 150718–9.]

Cauca: El Tambo, Cauca River, 5,100 ft., ANSP 25379–82; Munchique, CNHM 54336, 54470–1; Quintana, CNHM 44001–8, 44010–40, 44044, 44047, 54339, 54422–7, 54429–55, 54486; Río San Juan, CNHM 54345; Popayán, CNHM 54542–4; Guisito [Huisito], west of El Tambo, CNHM 54545–6, 54550–3, 54555–63, 54565–7; Moscopán, ANSP 25383–7.

Chocó: Andagoya, CNHM 81858–9; Noanama, BM 1909.10.30.39; Novita, 150 ft., Río Tamana, Río San Juan, BM 1910.7.11.45–6; Peña Lisa, Condoto, BM 1913.11.12.80, 1914.5.21.77; 10 to 15 km. west of Playa de Oro, Río San Juan, USNM 147208–9; Pizarro, CNHM 54457.

Nariño: Imbilí, Río Mira, USNM 147430; west of Pasto, USNM 146248; North of Tumaco, Río Rosario, USNM 147487; Pasto, USNM 146469 (tentatively identified).

Valle: Near Buenaventura, BM 95.11.16.30–1, USNM 145793 [formerly BM 95.11.6.29]; Camp Carton de Colombia, lower Calima River, USNM 149722.

EQUADOR: Quimbo, BM 98.3.1.4–7.

PANAMA: Cerro Azul, USNM 54174; Cana, USNM 54231, 66318; USNM 63005; El Valle, ANSP 21797–800; Gatún, ANSP 24259–60; Río Grande, near Cana, USNM 92595.

***Phyllobates inguinalis* (Cope)**

Plate 10a–f

1868. *Prostherapis inguinalis* Cope, p. 137 (type locality, Truando River, New Granada, [Chocó], Colombia]).—Breder, 1946, p. 405.—Dunn, 1957, p. 77.—Gorham, 1963, p. 25.

1935. *Phyllobates inguinalis*.—Parker, 1935, p. 506.—Evans, 1947, p. 167.

1871. *Hyloxalus fuliginosus* Jiménez de la Espada, p. 59 (type locality, San José de Moti, Ecuador); 1875, pl. 3, figs. 1a–b (no text).—Myers, 1942, p. 155.—Breder, 1946, p. 405.

1960. *Prostherapis fuliginosus*.—Goin, 1960b, p. 437.

Description.—USNM 4349 (holotype), from Truando River, Chocó, Colombia. Tongue half as wide as mouth opening, oval, its posterior border free and unnotched; snout straight-sided, bluntly rounded at the tip when viewed from above, truncate and sloping slightly backward in profile, the upper jaw extending well beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout one-fourth their distance from eye. Canthus rostralis rounded; loreal region concave, furrowed at its junction with the nearly vertical upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter slightly greater than that of upper eyelid, equal to interval between nostrils. Tympanum indistinct, its greatest diameter apparently about two-fifths that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers rather short, with traces of webs at the base and with strong lateral ridges, first finger a trifle longer than second and fourth and reaching to base of penultimate phalanx of third, the disk of which covers about one-fourth the tympanum; an indistinct oval thumb pad present; a round palmar callus; metacarpal tubercles well developed. Toes moderately long, one-fourth webbed, third toe a little longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; disk of fourth toe covering about one-half the typanum and noticeably larger than that of third finger; a small, oval inner metatarsal tubercle and a smaller diagonal outer one; a slight tarsal ridge, ending one-third the way to heel and marked by an elongate tubercle at that point; a heavy skinfold on heel and knee. Body moderately stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts easily torn, nearly smooth, a few pustules on snout, behind ear, and along side of body; venter smooth, with some glandules on lower and posterior surfaces of femur; a swollen area above tympanum; no skinfold across the chest; no ventral disk; a pair of lateral external vocal sacs in the male, and sometimes "flanges" on the third finger.

Dimensions.—Head and body, 28.5 mm.; head length, 9.5 mm.; head width, 9 mm.; femur, 12.5 mm.; tibia, 12.5 mm.; foot, 11 mm.; hand, 7 mm.

Color in alcohol.—Although the type specimen is much faded, a part of its original pattern can be discerned. Top of head and anterior half of back pale russet to wood brown; sacral region ecru drab with irregular traces of russet in the middle; upper lip russet, with small drab spots near border of lip, but with edge of lip unspotted ecru; axilla white, followed by a narrow vertical cinnamon bar; a wide dark lateral band, its sinuous lower margin emphasized by a narrow darker line; a pale ecru stripe beginning behind eye and bordering the dark lateral stripe above, then descending diagonally across it and continuing as a pale elongate spot just in front of groin, apparently continued on anterior proximal surface of femur; posterior femur tibia, and forearm covered by coarse dark reticulations extending to upper limb surfaces as dark crossbands; venter ecru drab, with a few cinnamon spots on lower femur and tibia; soles of feet and palms of hands russet, the tubercles, disks, and webs paler.

Remarks.—While some freshly preserved frogs are more or less clove brown, others are light brown, showing three darker chevrons on the back—the first chevron between the upper eyelids, the second between the shoulders, and the third on the sacrum. The light lateral stripe in front of the groin is most noticeable, sometimes narrowing and extending to the shoulder, sometimes breaking into a series of small light dots. This light extension lies across the center of a wide dark longitudinal stripe originating on the tip of the snout and continuing to the groin. On lighter examples this dark stripe often is apparent, but sometimes it is suggested only by small light and dark spots along the side on both borders of the lateral stripe. The white stripe often continues along the front of the femur, although it may be interrupted by the dark femoral crossbands.

Sometimes the venter is nearly immaculate except for some scattered dark spots around the chin, and sometimes it is heavily spotted over the entire belly, with some large dark spots on the lower outer limb surfaces.

The adpressed heel reaches the center of the eye in half the frogs examined and to the anterior or the posterior corner of the eye in the other half. The first finger is longer than the second, sometimes considerably and sometimes slightly so. Several males from El Centro (USNM 150174, 150176–7) have the membranes of the third finger widened into large "flanges." The webbing of the toes is quite variable being a mere trace in some frogs but extending for about one-fourth the length of the fourth toe in others. The venter is smooth in nearly all examples at hand, although a few show granules on the lower femur and beside the vent.

A young specimen from El Centro (USNM 150185) that measures 10 millimeters in head and body length is fully metamorphosed, having no tail or other larval characteristics. An 8-millimeter tadpole from the same place (USNM 150186) has a tail 9.5 millimeters long, although the limbs are fully formed.

Nearly all preserved specimens show abrasions of the skin.

Specimens Examined

COLOMBIA

Bolívar: Alto de Quimarí, CNHM 61827–9; probably upper Sinú River, CNHM 61778–82.

Boyacá: Leiva, USNM 150692.

Caldas: 20 km. south-southeast of Manizales, 2,860 m., USNM 146466; nine km. east of Santa Rosa de Cabal, USNM 150719.

Chocó: La Granja, USNM 144995; Truando, USNM 4349 (holotype).

Nariño: West of Pasto, USNM 146248; Pasto, USNM 146469.

Norte de Santander: La Selva, USNM 147125–31; Santa Librada, Sarare region, USNM 146939–41.

Santander: El Centro, USNM 150171–86, 146929–36, CNHM 81752–8.

Valle: Santa Elena, USNM 146942–51.

PANAMA: Cerro Manguillo, 2,800 ft., Veragua, ANSP 22494; El Valle, 2,000 ft., USNM 129901–4, 140659–60; Jacinto, Herrera, 2,250 ft., ANSP 22345–6; La Loma, USNM 139900–4; Las Minas, 1,150 ft., ANSP 22557; Pequeni River, head of Madden Lake, ANSP 21738–9; Tres Puntas, 2,050 ft., Herrera, ANSP 22543–4; Cana, USNM 50227; Río Cana, USNM 66319–20; Cerro Azul, USNM 140060; El Valle de Antón, USNM 118229; La Campana, USNM 139691–3; near Valle de Antón, USNM 139710.

***Phyllobates subpunctatus subpunctatus* (Cope)**

Plate 11a–c

1899. *Prostherapis subpunctatus* Cope, p. 5, pl. 1, fig. 2 (type locality, Bogotá [Cundinamarca,] Colombia).—Peracca, 1914, p. 103.—Hellmich, 1939, p. 8 (reprint).—Dunn, 1944a, p. 73.—Gorham, 1963, p. 25.

1899. *Prostherapis variabilis* Werner, p. 473 (type localities, all in Cundinamarca, Colombia: Alto von Sibate, 2,800 m.; Tierra Nigra, Fusagasugá, 2,830–2,300 m., Boquerón of Bogotá; La Unión, Chingasa, 1,000–2,400 m.; Páramo of Bogotá, road to Choachi; Páramo of Fusagasugá).—Dunn, 1944a, p. 73.

1916. *Prostherapis tarsalis* Werner, p. 303 (type locality, Bogotá, [Cundinamarca,] Colombia).—Dunn, 1944a, p. 73.

1920. *Phyllobates subpunctatus*.—Barbour and Noble, 1920, p. 401.—Dunn, 1924, p. 7; 1944c, p. 520; 1957, p. 78.—Noble, 1926b, p. 9.—Stebbins and Hendrickson, 1959, p. 503, fig. 1.

Description.—CNHM 81887, an adult female from Bogotá, Cundinamarca, Colombia. Tongue slightly more than half as wide as mouth opening, oval, its posterior border free and very faintly notched; snout rounded when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout nearly equal to their distance from eye. Canthus rostralis distinct; loreal region flat, with a slight furrow between it and the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum very distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers long, with bulbous tips, with lateral ridges, free, first finger a little shorter than second, which reaches to base of penultimate phalanx of third, the tip of which covers about one-eighth the tympanum; a small, weak thumb pad present; a round palmar callus; metacarpal tubercles well developed. Toes webbed at the base, long, ridged, third toe much longer than fifth, its disk reaching midway on antepenultimate phalanx of fourth; disk of fourth toe covering nearly one-fourth the tympanum, and larger than that of third finger; a distinct oval inner metatarsal tubercle and a smaller round outer one; a heavy tarsal ridge, ending diagonally midway across the tarsus in a heavy tubercular ridge; a skinfold on heel and knee. Body moderately slender, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior border of tympanum; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels fail to touch. Skin of upper parts resistant to abrasion, nearly smooth anteriorly (pustular under the lens), minutely granular on sacrum; venter coarsely granular on belly and lower femur, becoming smoother on chest, chin, and sides; no glandular ridge from posterior corner of eye; a low swelling in parotoid region; no skinfold across the chest; a slight ventral disk; apparently no external vocal sacs.

Dimensions.—Head and body, 22 mm.; head length, 7.5 mm.; head width, 7.5 mm.; femur, 8.5 mm.; tibia, 9.5 mm.; foot, 10.5 mm.; hand, 6 mm.

Color in alcohol.—Dorsum cinnamon, with four indistinct sepia stripes along the back, the inner pair broken up into elongate spots; a large, square sepia spot between and behind eyes, the snout pale wood brown in front of this spot; upper lip wood brown, immaculate; upper surfaces of limbs wood brown, with wide diagonal sepia crossbands; a wide light dorsolateral stripe from posterior corner of eye diagonally to groin, bordered below by a slightly narrower sepia stripe whose anterior part commences on the loreal region; venter pinkish-buff to vinaceous-buff, with small scattered sepia spots beginning on anterior belly and ending at level of groin; lower limb surfaces vinaceous pink, with some large seal brown spots on outer parts of femur, tibia, and foot; posterior femur with the suggestion of a light longitudinal stripe bounded below by a broken and irregular sepia stripe and above by the ends of the diagonal sepia crossbands; palms of hands and soles of feet vinaecous-buff, with darker areas on outer phalanges of foot, the tubercles and disks lighter; the minute webs between the toes nearly white.

Remarks.—Although Dunn (1944c) wrote that *subpunctatus* was limited to the general vicinity of Bogotá in southeastern Cundinamarca, he nevertheless identified as this species two examples that he collected in Villavicencio, Meta, during his visit of 1943–1944. Hno. Nicéforo María has sent eight other examples from the same locality, and these resemble Dunn's specimens closely, all of them seemingly indistinguishable from the Bogotá frogs.

A dark stripe or series of spots nearly always is present on the anterior femur. Above this the top of the femur may be pale to medium brown, immaculate or with a few small dark dots. The posterior femur may have a continuous dark stripe like that on the anterior surface, or a series of irregular dark markings, or many heavy or medium spots. The light dorsolateral stripe beginning behind the eye is wide and distinct on nearly all examples, and it slants downward from above the level of the elbow, ending in the groin. The dark area bordering it above is narrow and often broken up into spots anteriorly. The sides are dark, this area being quite wide and ending in an irregular border along the sides of the body.

Some frogs (USNM 151127–79) from Puracé, Cauca, suggest *subpunctatus* in many characteristics but vary slightly from Meta and Cundinamarca examples. Their critical measurements agree except for foot length, which is less in the Cauca frogs. The largest example in the Cauca series is 23.5 millimeters in length. The skin is not abraded in any specimen in the series. Some examples have a few large conical tubercles above the knee and on the upper surface of tibia and foot. The toes are unwebbed in 18 adults, slightly webbed in 20, and with webs almost one-eighth the length of the fourth toe in three. The first and second fingers are subequal in 24, while the second finger seems to be slightly longer in 18. The heel extends no further than the tympanum in eight and to the center or to the posterior or anterior corner of eye in 33.

The belly is more or less granular, the back practically smooth, and the toes webbed at the base (although sometimes very slightly) in the 48 examples at hand from Cundinamarca and Meta. The coefficient of variation in all critical measurements falls between 5.4 and 7.9 in these examples. The heel reaches between the shoulder and the posterior corner of the eye in 74 percent of the frogs, to the center of the eye in 24 percent, and to the anterior corner of the eye (in only one case) in 2 percent.

The venter may be immaculate pale buff or light olive, but sometimes a rather concentrated dark spotting appears on the posterior half of the belly and on the under surface of the femur, while again only a few dark spots may show, mostly near the lateroventral area and along the midline of the lower femur.

An example from Bogotá mentioned by Boulenger (1882a, p. 194) as having been identified by Günther as *Liuperus elegans* Peters has been loaned to us by the British Museum (BM 68.3.4.7). Its color is almost gone but otherwise it is in good condition and its measurements and other characteristics prove it to be a true *subpunctatus.* Peters' true *Liuperus elegans* definitely has been identified as an *Eleutherodactylus* and is treated in the present paper as *Eleutherodactylus elegans* (Peters).

Specimens Examined

COLOMBIA

CUNDINAMARCA: USNM 146876–8, MLS 402; near Bogotá, USNM 94967–77; Bogotá, CNHM 81886–9, 132989–90, MCZ 7309–14, 9036–40, USNM 118715–6, BM 68.3.4.7; 18 km. east of Bogotá, USNM 142800–4; páramo above Bogotá, 14 km. east of Bogotá, USNM 146213; Parque Nacional, USNM 150252–61; up from Bogotá, 3,000 m., USNM 150262–4 (150264 consists of three tadpoles); Boquerón, 2,800 m., USNM 150265; Choachí, MCZ 9734–9, USNM 118237–8; El Dintel, USNM 146879–87; El Verjón, páramo just east of Bogotá, USNM 150722; La Mesa, 40 mi. west of Bogotá, USNM 146888–92; vicinity of Monserrate, near Bogotá, 3,000 m., USNM 145699–705; Monte Redondo, USNM 138758; north of Albán, MLS 386; northeast of Nazaret, USNM 145104; Páramo Cruz Verde, 3,500 m., USNM 150267; Páramo de Palacio, USNM 144996–7, 150268–94; Sabana de Bogotá, Municipio Chía, Cerro de Torquita, USNM 150266; San Miguel, 2,800–2,900 m., USNM 150295–312, MCZ 16268; Tequendama, Abayo, CNHM 81884–5; three km. below Tequendama, CNHM 132991–3; east base of Cordillera of Bogotá and extreme limit of llanos, ANSP 24396–7.

META: Villavicencio, USNM 146921–9, 150313–4.

***Phyllobates subpunctatus walesi*, new subspecies**

PLATE 11D–F

Holotype.—SUNHM 20290, from Laguna de Tota, Boyacá, Colombia, collected from under rocks along northeast shore of the lake, at about 10,000 feet, by J. H. Wales, February 3, 1960.

Paratypes.—SUNHM 20291–302, USNM 145805 (formerly SUNHM 20303), same data as holotype; USNM 150710, Arcabuco, Boyacá; USNM 150709, 150711–4, Tunja, Boyacá; USNM 150701–8, Peligro, near Ramiriqui-Rondon Road, Boyacá; USNM 151874, Zetaquia, near Miraflores, Boyacá; USNM 150694–700, Páramo de la Rusia, Santander.

Diagnosis.—Resembling *Phyllobates subpunctatus,* but with the tibia very short—between 37 and 46 percent of total length, averaging 41.1 percent in 13 examples—first and second fingers usually subequal, or first finger shorter than second; toes nearly one-fourth webbed to less than one-eighth webbed; adpressed heel reaching to posterior corner of eye or posterior border of tympanum; tongue not indented; dorsal skin smooth, resistant to tearing or abrading; throat and chest immaculate cream buff; belly with round brown spots becoming larger and closer together posteriorly; lower anterior edge of femur with a wide light stripe bordered above and below by dark stripes, and a similar light, dark-bordered stripe on front of forearm; maximum size known, 23 millimeters.

Description of holotype.—Tongue as wide as mouth-opening, broadly ovate, its posterior border free and unnotched; snout very obtusely pointed when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis rounded but definite; loreal region concave, the upper lip flaring slightly beneath it. Eye large, prominent, its diameter four-fifths its distance from tip of snout; interorbital diameter twice that of upper eyelid and equal to interval between nostrils. Tympanum small but distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers moderate in length, with small lateral ridges and faint traces of a web, first and second fingers subequal, fourth finger much longer than either and reaching to base of penultimate phalanx of third, whose disk covers about one-eighth the tympanum; a small distinct oval thumb pad; a larger round palmar callus; metacarpal tubercles well developed. Toes moderate, nearly one-fourth webbed, third toe a little longer than fifth, reaching to center of antepenultimate phalanx of fourth, the disk of which covers about one-fourth the tympanum and is larger than that of third finger; a small but distinct inner metatarsal tubercle and a somewhat larger, rather prominent outer one: a strong tarsal ridge, ending in a diagonal swelling midway to heel; a pronounced skinfold on heel and knee. Body rather stout, in postaxillary region a little wider than greatest width of head. When hind leg is adpressed, heel reaches to posterior border of tympanum; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts not subject to abrasion, smooth anteriorly, granular above anus; a glandular swelling from above tympanum, narrowing to a ridge along side, bending downwards to end in a semicircular gland just in front of groin; venter smooth; some weak granules on lower surface of femur; some very fine diagonal glandular ridges on side; no skinfold across the chest; no ventral disk; no apparent external vocal sacs in male.

Dimensions.—Head and body, 23 mm.; head length, 7 mm.; head width, 7.5 mm.; femur, 9 mm.; tibia, 9 mm.; foot, 10 mm.; hand, 6 mm.

Color in alcohol.—Dorsum, including head and upper limb surfaces, clove brown; a curved black bar between the eyes; a light stripe from snout tip, continuing below canthus to eye, and following below the narrow glandular line to groin, where it curves downward in front of femur; throat and chest straw yellow with a few sepia spots below chin and a narrow sepia line around lower jaw; a wide clove brown band across the anterior half of the belly, the remaining half being wood brown with many round dark spots scattered over it, these spots being black on the dark area and sepia on the lighter area.

Remarks.—In the examples at hand, variation in the critical measurements is not excessive, being from 4.3 to 8.3 millimeters. The toes usually show distinct traces of webs, from about one-eighth to nearly one-fourth the length of the fourth toe. The first and second fingers are subequal in 14 frogs, and the first finger is decidedly shorter than the second in three others and is not fully developed in a juvenile. The heel reaches to the posterior border of the tympanum in most specimens and to the posterior corner of the eye in one example. The tibia is proportionately shorter in this subspecies than in any other known Colombian *Phyllobates* except *mertensi*, a larger and much different frog.

The ventral pattern is nearly the same in all examples from Laguna de Tota. The dark ventral spots are more densely grouped in some, and more widely scattered and less evident in a few. SUNHM 20298 is paler than the others and has three dark longitudinal lines on the back, the median one encircling a pale diamond-shaped spot behind the occiput and the two outer ones bordered below by a pale stripe beginning in a wide light area covering the glandular swelling behind the eye, then narrowing above axilla and continuing diagonally to groin. This latter stripe is not continuous with the one on the lower anterior femur, as a narrow black ring encircles the leg at its insertion.

Distinct traces of Saturn red can be seen on the lower surfaces of arms, hands, thighs and feet of specimens in the series USNM 150711–4 from Tunja. In one of these, the central part of the belly is immaculate; in the others large dark dots appear, with a sprinkling of very fine dots around them. In all of the Tunja frogs the chin has few to many brown dots, but the throat and chest are immaculate, or nearly so.

The nominate form of *subpunctatus* is known at present only from Cundinamarca and Meta. Its tibia is usually longer than that of the Boyacá form, averaging 43.7 percent of the total length in the 48 examples measured. Average length of tibia in the Boyacá form is 41.2 percent. The heel consequently reaches the eye in 63 percent of true *P. subpunctatus*, and to the tympanum or shoulder in 37 percent of *P. s. walesi*. The webs on the toes are much less strongly developed in the latter.

The Boyacá frogs are darker in color, and the wide light dorsolateral stripes, so obvious in most Cundinamarca examples, can be made out only in one or two specimens of *P. s. walesi*. The dark spots on the belly, however, are much more apparent in *walesi*. The known maximum size of *walesi* (25 mm.) appears to be a little less than that of the nominate form (27.5 mm.).

The eight examples from Peligro on the Ramiriqui-Rondon road have relatively longer legs than the other specimens, as the adpressed heel reaches to the center or to the posterior or anterior corner of the eye; in the other examples it extends from the anterior shoulder insertion to the center of the tympanum, except in two individuals in which it reaches the posterior corner of the eye. These eight specimens are rather similar in color, although five have black throats (probably a male characteristic) while the other three have light throats that are more or less thickly black-spotted. Two of the five specimens from Tunja show a dark suffusion on the chin. All other examples have either an immaculate throat or a pale throat with scattered small black spots.

It is not feasible to give a separate name to the Peligro frogs at this time. The collection and study of more extensive material may serve to differentiate them positively.

This form is named in honor of its collector, J. H. Wales.

Phyllobates vergeli **(Hellmich)**

PLATE 9F–H

1940. *Hyloxalus vergeli* Hellmich, 1940b, p. 122, figs. 1, 2 (type locality, Finca El Vergel, 1,800 m., near Fusagasugá, Cundinamarca, Colombia).
1963. *Prostherapis vergeli.*—Gorham, 963, p. 25.

Description.—MLS 309, a young adult from two kilometers southwest of Fusagasugá, Cundinamarca, Colombia. Maxillary teeth present but rather weakly developed; tongue half as wide as mouth opening, ovate, its posterior border free, lobate, slightly notched in the center; snout broadly obtuse when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis rounded; loreal region nearly flat, descending vertically to the upper lip. Eye large, prominent, its diameter nearly as great as its distance from tip of snout; interorbital diameter 1⅓ times that of upper eyelid, equal to interval between nostrils. Tympanum rather indistinct posteriorly, its greatest diameter about one-third that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderate in length, with lateral ridges, free, first finger shorter than second, fourth longer than either, reaching to base of penultimate phalanx of third, which covers about one-third the tympanum; a small oval thumb pad present; a larger rounded palmar callus; metacarpal tubercles well developed. Toes moderately long, one-half webbed, third toe much longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; disk of fourth toe covering about one-third the tympanum and about the same size as that of third finger; a weak oval inner metatarsal tubercle and a more distinct, rounded outer one; a heavy tarsal ridge, ending diagonally midway to heel; a distinct skinfold on heel and knee. Body moderately slender, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the sides, knee and elbow greatly overlap; when hind legs are bent at right angles to body, heels barely touch. Skin of upper parts resistant to abrasion, smooth to pustular, with some very weak tubercles on sacrum; venter smooth; an indistinct, wide glandular ridge from posterior corner of eye above tympanum, ending above shoulder; no skinfold across the chest; a slight ventral disk; no external vocal sacs in this specimen.

Dimensions.—Head and body, 22.5 mm.; head length, 7.5 mm.; head width, 7.5 mm.; femur, 11 mm.; tibia, 11.5 mm.; foot, 9.5 mm.; hand, 6 mm.

Color in alcohol.—Back olive-gray with a wide, blackish slate, middorsal stripe beginning on the snout and continuing to occiput; a wide slate chevron mark above the shoulders dividing posteriorly into two dark stripes enclosing a light central area on the lumbar region and widening and becoming irregular on the sacral region; venter immaculate pale cream-buff; side of body pale olive-gray with small dark dots, especially concentrated below a light diagonal line entering the groin but not extending forward beyond the level of the adpressed elbow; arms and legs very light drab-gray with three (on tibia) or four (on femur) wide slate crossbars; side of head olive-gray, with a slate-black stripe from nostril to eye through loreal region, continuing behind eye on wide supratympanic ridge and curving upward and around arm insertion to mark a pale semicircle around the axilla; posterior femur with a pearl gray irregular stripe limited above by the ends of the crossbars and below by some scattered slate-gray spots; soles of feet and palms of hands olive-gray, the webs between the toes white, and the disks slate-gray.

Remarks.—This young specimen from the type locality agrees reasonably well with the type description, except in a few points. Its back is smooth to pustular, with a few very weak granules on the sacrum, while the type has the back finely granular. This difference may result from age and manner of preservation, as do the differences in size of finger and toe disks. The young specimen is darker, but the chevron mark above the shoulders that appears in the figure of the type, as well as some dark spots on the top of the head, may represent the dark middorsal head stripe of the former.

Two examples from Pueblo Nuevo near Nilo, not far from the type locality, agree well with MLS 309 and with the description of the type. The toes in these three specimens are a little more than to a little less than one-half webbed. In one example, the adpressed heel reaches between the eye and the nostril. The venter is immaculate except for some dark suffusions on the chin and throat. The dark bars across the femur are sharp in one example, moderate in another, and very faint in the third; otherwise, the pattern is similar in all three.

Specimens Examined

COLOMBIA

Cundinamarca: Two km. southwest of Fusagasugá, MLS 309; Pueblo Nuevo, near Nilo, USNM 151876-7.

Subfamily Raninae

Sternum bony. Terminal digits pointed or slightly dilated, without disks above or below.

Genus *Rana* Linnaeus

1758. *Rana* Linnaeus, p. 210 (type species, *R. temporaria*).

Generic diagnosis.—Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth present. Tympanum distinct or hidden. Outer metatarsals separated by a web. Omosternum and sternum with a strong bony style. Terminal phalanges acute, transversely dilated, or T-shaped.

Rana palmipes Spix

Plate 12a–c

1824. *Rana palmipes* Spix, p. 5, pl. 5, fig. 1 (type locality, "Amazonenfluss").—Peters, 1873a, p. 205; 1873b, p. 622.—Boulenger, 1882a, p. 48; 1888a, p. 40; 1891a, p. 453; 1913, p. 1026; 1919, pp. 412, 415; 1920, p. 473.—Cope, 1887b, p. 19.—Günther, 1901, p. 202.—Baumann, 1912, p. 161 *et seq.*—Noble, 1918, p. 316, pl. 14.—Beebe, 1919, p. 210.—Miranda-Ribeiro, 1923b, p. 802, 2 pls., 1 map; 1926, p. 165, figs. 91, 92; 1937a, p. 56.—Roux, 1926, p. 292.—A. Lutz, 1927, p. 40, pl. 9, figs. 7–9.—L. Müller, 1927, p. 282.—Nicéforo María, 1930, p. 51.—Crawford, 1931, p. 37.—Schmidt, 1932, p. 161.—Kellogg, 1932, p. 200.—Crawford and Jones, 1933, p. 91.—Parker, 1935, p. 505.—Mello-Leitão, 1937, p. 278.—Hellmich, 1939, p. 537.—Schubart, 1939, p. 57.—Dunn, 1944c, p. 521.—Taylor and Smith, 1945, p. 605.—Breder, 1946, p. 420, figs. 22, 23.—Smith and Taylor, 1948, p. 98.—Schmidt and Inger, 1951, p. 449.—Lutz and Kloss, 1952, p. 676.—Aleman, 1952, p. 28, fig. 4.—Johnson, 1952, p. 284.—Taylor, 1952, p. 908.—Goin and Layne, 1958, p. 113.—Stebbins and Hendrickson, 1959, p. 537.—Ginés, 1959, p. 140.—Rivero, 1961, p. 176; 1963a, p. 93; 1964b, p. 311.—Gorham, 1963, p. 26.

1845. *Rana juninensis* Tschudi, p. 64 (type locality, Lake of Junin, Peru, 13,000 ft.).—Peters, 1873c, p. 622.—Boulenger, 1920, p. 473.

1859. *Rana affinis* Peters, p. 403 (type locality, Caracas, Venezuela); 1871, p. 403; 1872, p. 205.—Boulenger, 1920, p. 473.
1859. *Ranula gollmeri* Peters, p. 402 (type locality, Caracas, Venezuela); 1872, p. 205.—Boulenger, 1920, p. 473.
1863. *Rana clamata guianensis* Peters, 1863a, p. 412 (type locality, British Guiana).—Boulenger, 1920, p. 473.
1866. *Ranula affinis.*—Cope, 1866b, p. 130; 1868, p. 117; 1870, p. 167.—Boulenger, 1920, p. 473.
1867. *Pohlia palmipes.*—Steindachner, 1867, p. 15, pl. 1, figs. 5–8.—Boulenger, 1920, p. 473.
1871. *Ranula palmipes.*—Cope, 1871b, p. 222.—Boulenger, 1920, p. 473.
1874. *Ranula brevipalmata* Cope, 1874b, p. 131 (type locality, Nauta, Peru); 1876, p. 114.—Boulenger, 1920, p. 473.
1874. *Ranula nigrilatus* Cope, p. 131 (type locality, Nauta, Peru).
1877. *Hylarana brevipalmata.*—Brocchi, 1877, p. 175; 1882, p. 62.—Boulenger, 1920, p. 473.
1877. *Rana vaillanti* Brocchi, p. 175 (type locality, Mullins River near Belize, British Honduras); 1882, p. 11, pl. 2, figs. 1–1c.—Boulenger, 1920, p. 473.
1882. *Rana nigrilatus.*—Boulenger, 1882a, p. 49.—Baumann, 1912, p. 161.—Boulenger, 1920, p. 473.
1882. *Rana copii* Boulenger, 1882a, p. 49 (substitute for *Ranula* [=*Rana*] *brevipalmata* Cope, 1874, preoccupied by Peters, 1871); 1920, p. 473.—Baumann, 1912, p. 161.
1901. *Rana bonaccana* Günther, p. 201, pl. 60, fig. B (type locality, Bonacca Island, off the coast of British Honduras).—Boulenger, 1920, p. 473.
1901. *Rana melanosoma* Günther, p. 203, pl. 63, fig. B (type localities, Duenas, Guatemala, and Hacienda Rosa de Jericho (3,250 ft.), Nicaragua).—Boulenger, 1920, p. 473.
1913. *Rana brevipalmata.*—Fowler, 1913, p. 166, pl. 9.—Boulenger, 1920, p. 373.
1913. *Rana brevipalmata rhoadsi* Fowler, p. 166, pl. 9, upper fig. (type locality, Bucay, Province of Guayas, Ecuador).—Barbour and Loveridge, 1929, p. 326.—Boulenger, 1920, p. 473.
1920. *Ranula nigritatus.*—Boulenger, 1920, p. 473.
1945. *Rana palmipes rionapensis* Andersson, p. 3 (type locality, Río Napo, Ecuador, 400 m.).

Description—USNM 142198, an adult from Leticia, Amazonas, Colombia. Vomerine teeth in two small, slanting, widely separated series between the choanae; tongue two-third as wide as mouth opening, ovate, its posterior border free and very deeply notched; snout elongate, rounded at the tip when viewed from above, rounded in profile, the upper jaw extending somewhat beyond the lower. Nostrils dorsolateral, projecting, their distance from end of snout a trifle less than their distance from eye. Canthus rostralis straight, prominent; loreal region concave, sloping sharply to upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter slightly less than that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest width two-third that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers moderately long, the tips slender, with distinct lateral ridges, free, first finger longer than second and equal to fourth, the tips of both second and fourth reaching midway on penultimate phalanx of third; an elongate thumb pad present; a small rounded palmar callus; metacarpal tubercles well developed. Toes entirely webbed, third and fifth subequal, their tips reaching almost to base of antepenultimate phalanx of fourth toe; a small elongate inner metatarsal tubercle; no outer tubercle; a heavy skinfold on heel and knee. Body moderately slender, in postaxillary region less than greatest width of head. When hind leg is adpressed, heel reaches to anterior corner of eye; when limbs are laid along the sides, knees and elbows considerably overlap; when hind legs are bent at right angles to body, heels overlap slightly. Skin of upper parts smooth; a pair of glandular dorsolateral ridges from posterior corner of eye almost to groin; a few small pustules on sacral region and above vent; venter smooth, except for numerous small transverse wrinkles from level of axilla to groin; a heavy glandular ridge from posterior corner of eye above tympanum, ending behind and below corner of mouth; a distinct skinfold across the chest; a pronounced ventral disk; apparently no external vocal sacs.

Dimensions—Head and body, 75 mm.; head length, 30.5 mm.; head width, 28.5 mm.; femur, 35 mm.; tibia, 38 mm.; foot 37.5 mm.; hand, 21.5 mm.

Color in alcohol—Dorsum smoke gray with irregular drab mottlings; upper parts of legs and feet with three wide transverse brown bars alternating with two or three paler ones; posterior femur coarsely marbled with clove brown and pale buff; anterior femur with a few brown spots on the pale buff ground color; venter pale buff, with a few faint brown spots on chin and chest; lower surfaces of legs buff with many small dark round spots; webs of toes mottled with brown and buff, the lower sides of toes and tarsus quite dark; a wide brown stripe slightly broken by buff spots along forearm from base of thumb to elbow; sides smoke gray to drab above, paler below and heavily spotted with dark brown; side of head drab gray, with a narrow darker gray line indistinctly paralleling the edges of both upper and lower jaws; tympanum nearly encircled by a brown ring.

Remarks—Although a thorough comparison of all available material throughout the vast range of this frog may validate some names now considered as synonyms, and possibly demand the description of still other forms, the above synonymy, compiled mostly from Boulenger's and Taylor's writings, is more or less accepted at the present time. Colombian specimens at hand are from Amazonas, Antioquia, Caquetá, Cauca, Chocó, Cundinamarca, Meta, Santander, Tolima, and Valle. The species probably occurs also in other parts of the country.

Some of the frogs from Leticia have a much paler ground color than the described specimen, so that the dark leg bands stand out more clearly, and a scattering of large dark spots on the sacral region and center of back can be seen. The large old specimen from Villavicencio (MLS 266) has the toe webs nearly uniform brown in color, while the dark spots are concentrated along the sides and in the groin.

The largest specimen measured (MLS 266, from Villavicencio, Meta) has a total length of 110 millimeters. In a tadpole measuring 28 millimeters in head and body length (AMNH 22600 from Sonsón, south of Medellín, Antioquia). the arms and legs had appeared and the tail was reduced to 15 millimeters in length. In AMNH 39276 (from Envigado, Antioquia), measuring 40 millimeters, the arms, legs, ear, and mouth were completely developed, while a very slight tail vestige remained. In AMNH 39275 (42 millimeters, and also from Envigado), the tadpole is still in metamorphosis, with neither the adult tympanum nor mouth formed.

As for other wide-ranging species, a careful study of all available material of *Rana palmipes* from throughout its range is needed to discover the amount of geographical variation. As such a study cannot be attempted in this paper, only Colombian examples are listed here.

Colombian Specimens Examined

AMAZONAS: Leticia, USNM 142198–205, 146253–4, 147123–4; Puerto Nariño, USNM 144531.

ANTIOQUIA: Envigado, AMNH 39256, 39258–64, 39266, 39273, 39275–6, 39279; Medellín Valley, AMNH 39463–4; Sonsón, south of Medellín, AMNH 22600–3; four km. northeast of Bellavista, above Río Porce, 1,200 m., CNHM 63848.

CAQUETÁ: Mouth of Río Mecaya, USNM 144532–3; Río Mecaya, 185 m., CNHM 69750–1.

CAUCA: Near Moscopán, USNM 146418–20.

CHOCÓ: Andagoya, USNM 144534–6; Quesado River, tributary of Atrato River, AMNH 13602; Boca de la Raspadura, Atrato River, AMNH 13721; Chigorodó, USNM 151902; Rio San Juan, 10–15 km. west of Playa de Oro, USNM 147217–20 (juv.).

CUNDINAMARCA: Fusagasugá, USNM 144537, 151875.

META: Angostura, USNM 144540; Caño del Morrocoy, near El Refugio, tributary of Río Guayabero, USNM 150525; Granada, on Río Ariari, USNM 151473–5; Quebrada Honda, USNM 144538–9; Sierra de La Macarena, Caño Guapaya, USNM 147271; upper Río Güejar and El Mico, USNM 150522–4; Villavicencio, USNM 144541–2; AMNH 22599, MLS 266.

SANTANDER: 4.7 km. southeast of Bucaramanga, Lagos de Cacique, USNM 146249; El Centro, USNM 144543; Lebrija, 1,140 m., USMN 144544–53.

TOLIMA: Mariquita, USNM 144554–5.

VALLE: Río Calima, near Córdoba, USNM 145746–55; Camp Carton de Colombia, lower Río Calima, USNM 149738–40; El Tigre, USNM 151476; Virology Field Station, Río Raposo, USNM 151464–82.

Family MICROHYLIDAE

Frogs with firmisternal girdles, a tongue, and sacral diapophyses more or less expanded. They have no ribs or intercalary cartilages, and Eustachian tubes, if present, are paired. The larvae lack horny mandibles and labial teeth.

Key to Colombian Genera of Microhylidae

a^1. Tympanum concealed.
  b^1. Clavicles present.
    c^1. Posterior portion of prevomer present . . . . **Relictivomer**
    c^2. Posterior portion of prevomer absent . . . . . . **Elachistocleis**
  b^2. Clavicles absent.
    c^1. Palatines present . . . . **Glossostoma**
    c^2. Palatines absent. . . . . **Ctenophryne**
a^2. Tympanum distinct . . . . **Otophryne**

Genus *Relictivomer* Carvalho

1954. *Relictivomer* Carvalho, p. 13 (type species, *Hypopachus pearsei* Ruthven).

Generic diagnosis.—Prevomer divided with the posterior portion reduced to a small osseous plate which lies in the palatal region. Palatine bones absent. Clavicle present but short and curved. Procoracoid present. Tympanum concealed, snout short and very pointed.

Only one species is known from Colombia.

Relictivomer pearsei **(Ruthven)**

FIGURE 1

1914. *Hypopachus pearsei* Ruthven, p. 77 (type locality, Fundación, Colombia).—Ruthven, 1922, p. 50.—Barbour and Loveridge, 1946, p. 132.—Peters, 1952, p. 18.
1934. *Elachistocleis ovalis* (not of Schneider).—Parker, 1934a, p. 121.
1944. *Elachistocleis pearsei.*—Dunn, 1944c, p. 524: 1949, p. 19.
1954. *Relictivomer pearsei.*—Carvalho, 1954, p. 13.—Gorham, 1963, p. 26.

Diagnosis.—A microhylid with the tympanum concealed, clavicle and procoracoid present but short and curved, the posterior portion of the prevomer present, palatine bones absent, and a very pointed snout.

From *Otophryne robusta* it may be distinguished by having the tympanum concealed; from *Ctenophryne geayi* by the presence of the clavicle and procoracoid; from *Glossostoma aterrimum* by the absence of the palatine bone; and from *Elachistocleis ovalis* by the presence of the posterior portion of the prevomer and by the lighter colored belly, in which the pale of the belly is continuous with the light color in the axillary region so that there is no discrete axillary pale spot.

Description.—USNM 51215 (paratype), from Fundación, Magdalena, Colombia. A microhylid without vomerine teeth; choanae rather small and placed well forward in the roof of the mouth; tongue half as wide as mouth opening, an elongate oval in form, its posterior one-half free and unnotched. Snout short, pointed when viewed from above, pointed in profile, the upper jaw extending considerably beyond lower; nostrils more lateral than superior, not at all projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval but slightly less than their distance from eye. Canthus rostralis very slightly defined; loreal region rounded. Eye small, inconspicuous, its diameter slightly less than its distance from nostrils; palpebral membrane not reticulate; interorbital distance about three times the width of upper eyelid,

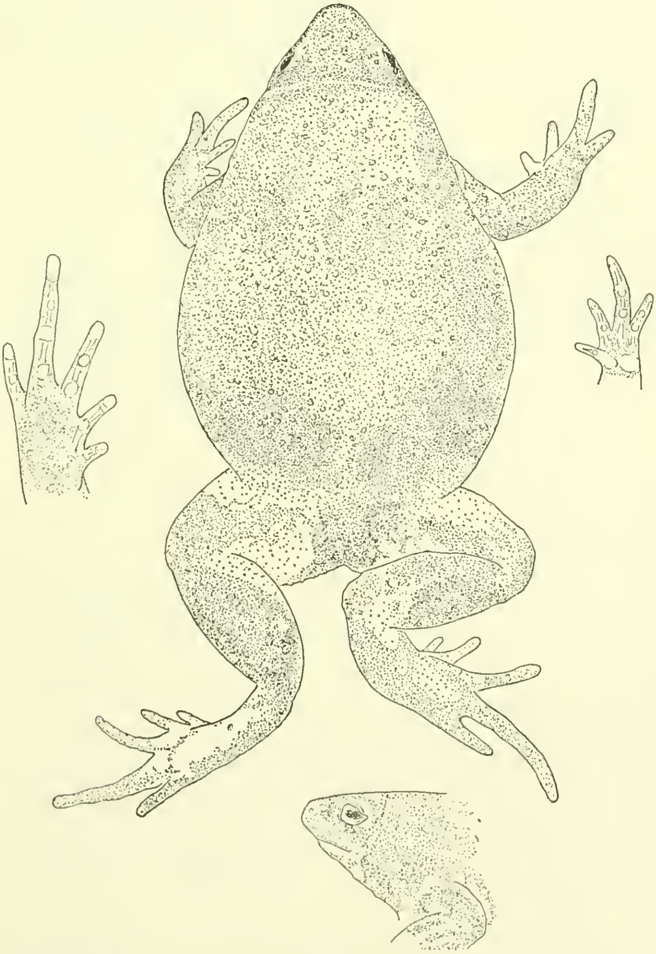

FIGURE 1.—*Relictivomer pearsei*, paratype, USNM 51215 (× 2).

which is about two-thirds the distance between nostrils. Tympanum concealed. Fingers unwebbed, fourth about equal to second, reaching to base of penultimate phalanx of third; no projecting rudiment of a pollex; no ulnar ridge. Toes without webs, third toe two phalanges longer than fifth; a distinct but small oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body short, in postaxillary region at least twice the greatest width of head; when hind leg is adpressed, heel reaches axilla; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap appreciably. Skin of upper parts smooth. A narrow fold of skin crosses back of head and passes downward on each side behind eye and angle of jaw. Skin of throat, chest, belly, and lower surface of thigh smooth; no apparent traces of a skinfold across chest; adult female, no vocal sac.

Dimensions.—Head and body, 33.4 mm.; head length, 8.3 mm.; head width, 8.8 mm.; femur, 12.7 mm.; tibia, 12.8 mm.; heel-to-toe, 20 mm.; hand, 7.6 mm.

Color in alcohol.—Top of head and dorsum uniform warm brown. Undersurfaces of throat, chest, belly, and limbs, and the groin and anterior and posterior surfaces of the thighs distinctly marbled in yellow and brown.

Variation.—The most notable variation in the specimens at hand is exemplified by the specimen (MLS 133) from Astillero. In this individual the belly, instead of being conspicuously and brightly marbled as it is in other specimens of *Relictivomer pearsei*, is nearly uniformly pale yellow, with a few brownish flecks under throat and on lower surfaces of thighs. The posterior surfaces of the thighs, on the other hand, are rather dark with a single narrow, yellow stripe running from behind the knee to the vent on each of them. Structurally this specimen does not seem to be different from other examples of *pearsei* in any way.

Since so many species tend to show some degree of incipient speciation in the Maracaibo Basin, it is not too surprising to find the single specimen of *pearsei* we have from there different from other individuals from west of the Cordillera Occidental. It may well be that when sufficient material becomes available the population in the Maracaibo Basin will prove to be deserving of a name.

Except for the specimen discussed above, there seems to be no significant variation in the specimens at hand. Some are darker than the others, but whether this is due to preservation or individual variation we do not know. Our largest specimen has a head-body length of 41.5 millimeters.

Remarks.—Since the recent monographer of this group in South America (Carvalho, 1954) saw fit to place this species in the genus

Relictivomer and since we have had very little first-hand experience with the other genera in South America, we follow him in the generic assignment. We must say, however, that, to us, *ovalis* and *pearsei* seem to be rather closely related, and in fact we must agree with Dunn (1949, p. 13): "I would take them for vicarious races save for the statement of Ruthven that the two occur together at Fundación."

Specimens Examined

COLOMBIA
- Antioquia: Medellín, AMNH 13539.
- Chocó: Sautatá, Río Atrato, CNHM 74908.
- Magdalena: Fundación, USNM 51215 (paratype).
- Norte de Santander: Astillero, MLS 133.
- Santander: El Centro, 112 m., AMNH 71044.
- Tolima: Mariquita, MLS 134, CNHM 81817.
- No Precise Locality: USNM 14718.

PANAMA: Chiriqui Province: 0.7 mi. north and 0.2 mi. west of David, AMNH 69876–7. Panama Province: 1 mi. west of Nueva Gorgona, AMNH 69880–3; 3 mi. south of Bejuco, AMNH 69878–9.

Genus *Elachistocleis* Parker

1927. *Elachistocleis* Parker, 1927a, p. 4 (type species, *Rana ovalis* Schneider).

Generic diagnosis.—Posterior portion of prevomer absent. Palatine bones absent. Clavicle present but short and curved. Procoracoid present. Tympanum concealed, snout short and very pointed.

Only one species is known from Colombia.

Elachistocleis ovalis (Schneider)

Figure 2

1799. *Rana ovalis* Schneider, p. 131 (type locality not given).—Shaw, 1802, p. 111.

1802. *Bufo surinamensis* Daudin, p. 91 (type locality, Suriname); 1803, p. 184.

1802. *Bufo ovalis*.—Daudin, 1802, p. 92; 1803, p. 187.

1820. *Rana bufonia* Merrem, p. 177 (substitute name for *Bufo surinamensis* Daudin).

1826. *Engystoma ovale*.—Fitzinger, 1826, p. 65.—Duméril and Bibron, 1841, p. 741.—Günther, 1858, p. 51.—Steindachner, 1864, p. 285.—Hensel, 1867, p. 140.—Boulenger, 1882a, p. 163; 1886a, p. 439; 1894, p. 347; 1898b, p. 131.—Cope, 1885b, p. 185; 1887, p. 53.—Boettger, 1885, p. 240; 1892, p. 22.—Peracca, 1895, p. 23; 1904, p. 11; 1914, p. 104.—Berg, 1896, p. 159.—Werner, 1899, p. 475.—Budgett, 1899, p. 305.—Lidth, 1904, p. 93.—Méhely, 1904, p. 211.—Baumann, 1912, p. 129.—Marelli, 1924, p. 585.—Miranda-Ribeiro, 1926, p. 184.—Lutz, 1927, pl. 8, fig. 2; 1928, p. 92.

1830. *Microps unicolor* Wagler, p. 200 (substitute name for *Rana ovalis* Schneider).

1910. *Gastrophryne ovalis*.—Stejneger, 1910, p. 166.

1920. *Engystoma ovale ovale*.—Miranda-Ribeiro, 1920a, p. 282.

1920. *Engystoma ovale concolor.*—Miranda-Ribeiro, 1920a, p. 284 (type locality, Ypiranga); 1926, p. 184.
1920. *Engystoma ovale lineata.*—Miranda-Ribeiro, 1920a, p. 284 (type locality, R. da Serra, São Paulo).
1920. *Engystoma ovale caesarii.*—Miranda-Ribeiro, 1920a, p. 284 (type localities, Piquete, Os Perus, Alto da Serra [São Paulo], Cubatao [Santos], and Ypiranga).
1920. *Engystoma caesarii mottae* Miranda-Ribeiro (nom. nud.), 1920a, p. 284 (type locality, São Paulo), 1926, p. 194.
1922. *Gastrophryne ovale,*—Ruthven, 1922, p. 51.
1926. *Engystoma ovalis.*—Nieden, 1926, p. 66.
1927. *Elachistocleis ovale ovale.*—Parker, 1927a, p. 4.
1929. *Elachistocleis ovale.*—Mertens, 1929, p. 286.—Dunn, 1931, p. 416.
1930. *Elachistocleis ovalis.*—Mertens, 1930, p. 163.—Crawford, 1931, p. 38. Parker, 1934, p. 121.—Myers, 1942, p. 155.—Dunn, 1944, p. 524; 1949, p. 13.—Carvalho, 1954, p. 15.—Rivero, 1961, p. 177; 1964a, p. 304.—Gorham, 1963, p. 26.

Diagnosis.—A microhylid with the tympanum concealed, clavicles and procoracoids present but short and curved, posterior portion of the prevomer absent, palatine bones absent, and snout very pointed.

The presence of clavicles and procoracoids separates *Elachistocleis ovalis* from species in the genera *Ctenophryne* and *Glossostoma,* while the concealed tympanum and the fact that the clavicles and procoracoids are short and strongly curved separate it from species of *Otophryne.* From *Relictivomer pearsei* it may be distinguished by having the belly dark with isolated light spots on the anterior face of the

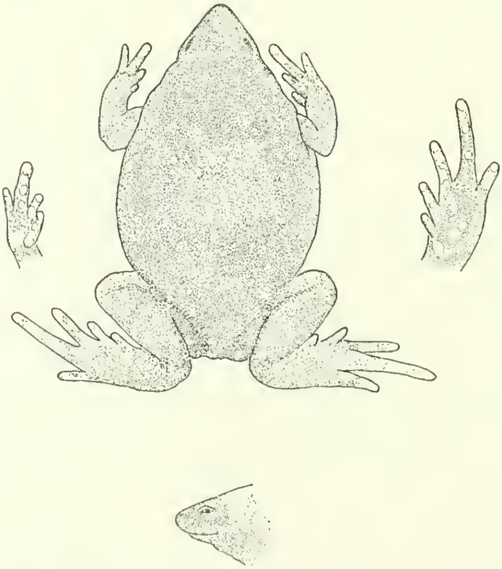

Figure 2.—*Elachistocleis ovalis,* FM 266 (same size).

thigh where it joins the body and usually present in the axillary region, and by having the posterior portion of the prevomer absent.

Description.—FM 266, from Villavicencio, Meta, Colombia. A microhylid frog without vomerine teeth; choanae moderate in size, ovate, placed well forward in the roof of the mouth. Tongue half as wide as mouth opening, an elongate oval in outline, its posterior half free and unnotched. Snout short, pointed when viewed from above, pointed in profile, the upper jaw extending considerably beyond lower; nostrils more lateral than superior, not at all projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis but very slightly defined; loreal region distinctly rounded. Eye small, inconspicuous, its diameter less than its distance from nostril; palpebral membrane not reticulate; interorbital distance about three times the width of upper eyelid, which is even less than distance between nostrils. Tympanum concealed. Fingers unwebbed, fourth finger about equal to second, reaching to base of penultimate phalanx of third; no projecting rudiment of a pollex; no ulnar ridge. Toes without webs, fourth toe nearly two phalages longer than third; a distinct oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body short, in postaxillary region at least twice the greatest width of head; when hind leg is adpressed, heel reaches axilla, when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels touch snugly. Skin of upper parts smooth. A narrow but distinct fold of skin crosses the back of the head and turns down on each side to pass behing the eye and the angle of the jaw. Skin of throat, chest, belly, and lower surface of thigh uniformly smooth; adult female, no vocal sac.

Dimensions.—Head and body, 43.5 mm.; head length, 10.1 mm.; head width, 11.1 mm.; femur, 15.8 mm.; tibia, 15.9 mm.; heel-to-toe, 18.4 mm.; hand 10.8 mm.

Color in alcohol.—Top of head and dorsum dark grayish brown. Underside of throat, chest, belly, and limbs faintly flecked yellowish gray. Rather distinct yellowish subaxillary and groin spots and a narrow yellowish line on the posterior surfaces of the thighs.

Variation.—The specimens at hand, all from the northern part of the range of the species, seem to be rather uniform in both pattern and structure. The rather distinctive, isolated yellow spot in the axilla and the one on the anterior face of the thigh where it meets the groin apparently are quite good key characters, for the inguinal spot on the thigh is present in every individual and the axillary spot appears in all except one specimen from Villavicencio. These same yellow areas are present in *R. pearsei*, but in that species such areas do not form distinctive isolated yellow spots, being continuous with the yellow of the belly. The largest specimen of *Elachistocleis ovalis* at hand has a head-body length of 39.3 millimeters.

Specimens Examined

COLOMBIA
- Boyacá: Corozal, near Río Casanare, USNM 152032–3.
- Córdoba: Junguilla, Cãno Betancí, USNM 152158.
- Meta: Caño Guapaya, Serranía de La Macarena, CJG 2340; Villavicencio, CNHM 81816, USNM 152204–8, MLS 132, 132a; Granada, on Río Ariari, USNM 151967–76.
- Vichada: Amenavné, Río Guaviare, USNM 152316.

VENEZUELA: Palenque, Guarico, USNM 128847–9.

Genus *Glossostoma* Günther

1900. *Glossostoma* Günther, p. 210 (type species, *Glossostoma aterrimum* Günther).

Generic diagnosis.—Clavicles and procoracoids absent, but palatines present. Tympanum concealed. Snout not particularly pointed.

Only one species is known from Colombia.

Glossostoma aterrimum Günther

Figure 3

1901. *Glossostoma aterrimum* Günther, p. 210 (type locality, Costa Rica).—Boulenger, 1913, p. 1025.—Nieden, 1926, p. 68.—Carvalho, 1954, p. 11.—Gorham, 1963, p. 26.

1927. *Gastrophryne aterrimum.*—Parker, 1927a, p. 5.

1934. *Microhyla aterrimum.*—Parker, 1934a, p. 143.—Dunn, 1944c, p. 524.—1949, p. 16.—Taylor, 1952, p. 914.

Diagnosis.—A microhylid with the tympanum concealed, clavicles and procoracoids absent, but palatines present.

Glossostoma aterrimum may be distinguished from species of the genera *Relictivomer*, *Elachistocleis*, and *Otophryne* by the absence of clavicles and procoracoids and from those of *Ctenophryne* by the presence of palatine bones.

Description.—CNHM 63849, four kilometers northeast of Bellavista, above Río Porce, Antioquia, Colombia. A microhylid without vomerine teeth; choanae rather large and broadly rounded; tongue two-thirds as wide as mouth opening, broadly ovate, its posterior border free and unnotched. Snout large for a microhylid, rather rounded when viewed from above, nearly truncate in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval slightly greater than distance from eye. Canthus rostralis poorly defined; loreal region very slightly concave and nearly vertical, the upper lip flaring out but little below it. Eye small, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about one-third the width of upper eyelid, which is relatively narrow and distinctly less than distance between nostrils. Tympanum practically concealed, just barely discernible at the surface on the right side, concealed on the left. Fingers without a trace of web at base, fourth finger a phalanx longer than second, just reaching to base of terminal phalanx of third, tips without digital expansions; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the antepenultimate phalanx, third toe much longer than fifth; no metatarsal tubercle apparent; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little wider than greatest width of head; when hind leg is adpressed, heel reaches almost to angle of jaw; when limbs are laid along the side, knee and elbow meet; when hind legs are bent at right angles to body,

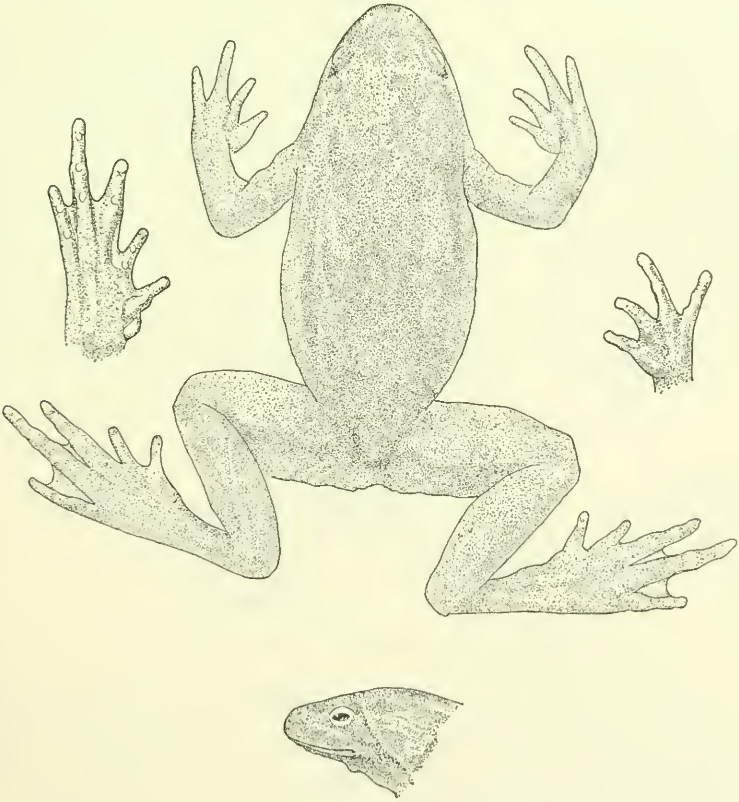

Figure 3.—*Glossostoma aterrimum*, CNHM 63849 (same size).

heels overlap slightly. Skin of upper parts smooth; a narrow, indistinct skinfold across back of head which, behind the eyes, becomes more distinct and passes downward and backward to terminate behind the angles of the jaw. Skin of body smooth except under the throat where it bears distinct, rounded, pimple-like granules and the lower surface of the thigh which is uniformly and very finely granular; no traces of a skinfold across chest; adult male; no vocal sac apparent.

Dimensions.—Head and body, 62.2 mm.; head length, 15.2 mm.; head width, 20.5 mm.; femur, 27 mm.; tibia, 29 mm.; heel-to-toe, 41.7 mm.; hand, 16.8 mm.

Color in alcohol.—In preservative the specimen is rather uniformly medium dark brown above, pale brown below. No evidence of a distinctive pattern is discernible.

Remarks.—We have had the opportunity of examining the specimen (MLS 247) that Dunn (1949, p. 16) reported from Muzo and of comparing it with the one described above, and for the present, we cannot agree with Dr. Dunn that it is surely *Glossostoma aterrimum.* The webbing on the feet is only about half as extensive as on the specimen described, and we cannot even palpate an unquestionable palatine. This latter, however, may be due to the condition of the specimen, for it is very soft; in fact, no hardened bones are palpable in any part of the suspensorium. In color and general build the two specimens are quite similar.

G. aterrimum is a distinctly web-footed microhylid from west of the Cordillera Oriental of Colombia, an analogue of *Ctenophryne geayi* east of the Cordillera. While both species have webbed feet, we suspect that this is evidence of convergence rather than close kinship, for the two are quite different in general appearance, and the fact that palatines are present in *Glossostoma* and absent in *Ctenophryne* does not seem indicative of closely related species.

Specimens Examined

COLOMBIA:
- Antioquia: 4 km. northeast of Bellavista, above Río Porce, CNHM 63849.
- Boyacá: Muzo, MLS 247.
- Caldas: Palestina, USNM 152145.

Genus *Ctenophryne* Mocquard

1904. *Ctenophryne* Mocquard, p. 308 (type species, *Ctenophryne geayi* Mocquard)

Generic diagnosis.—Clavicles, procoracoids, and palatines absent. Tympanum concealed. Snout pointed.

Only one species is known from Colombia.

Ctenophryne geayi Mocquard

FIGURE 4

1904. *Ctenophryne geayi* Mocquard, p. 308 (type locality, Sarare River, Colombia).—Nieden, 1926, p. 69.—Parker, 1934a, p. 123.—Dunn, 1944c, p. 524; 1949, p. 18.—Guibé, 1949, p. 59.—Carvalho, 1954, p. 7.—Gorham, 1963, p. 26.

Diagnosis.—A microhylid having a concealed tympanum and lacking clavicles, procoracoids, and palatines.

The absence of the clavicles and procoracoids separates this species from *Relictivomer pearsei*, *Otophryne robusta*, and *Elachistocleis ovalis*, while the absence of the palatines separates it from *Glossostoma aterrimum*.

Description.—MHNP 03-84 (holotype), from Río Sarare, Norte de Santander, Colombia. A microhylid without vomerine teeth; small, rounded choanae; tongue three-fourths as wide as mouth opening, pointed anteriorly, with well-developed cornua on each angle posteriorly, the cornua being free, a transverse row of glandular structures across roof of mouth. Snout small, triangular when viewed from above, broadly pointed in profile, the upper jaw extending beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis hardly defined; loreal region concave and more flattened than oblique, the upper lip flaring out, then rolling in below

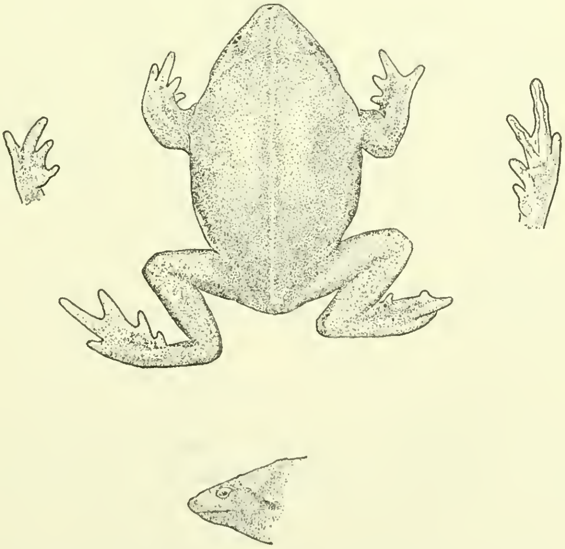

FIGURE 4.—*Ctenophryne geayi*, FM 357 (same size).

it. Eye very small, not prominent, its diameter equal to its distance from nostril; interorbital distance nearly twice internarial distance. No exposed tympanum; fingers without a trace of web, fourth finger slightly longer than second; no projecting rudiment of a pollex. Toes about one-half webbed, the web on fourth toe reaching the base of the antepenultimate phalanx, third toe much longer than fifth; an oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body stubby, in postaxillary region probably twice width of head; when hind leg is adpressed, heel reaches to anterior part of shoulder region; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels fail to meet. Skin of upper parts quite smooth, a transverse skinfold across back of head which continues downward over shoulder region to inner side of elbow; skin of throat and chest smooth, that of belly and lower femur also smooth; no skinfold across the chest; no inguinal gland; no vocal sac apparent.

Dimensions.—Head and body, 43.3 mm.; head length, 12 mm.; interorbital width, 6.6 mm.; femur, 17.6 mm.; tibia, 16.7 mm.; foot, 24.7 mm.; hand, 11(±) mm.

Color in alcohol.—Pale brown above, a much darker brown below, with a sharp line of demarcation between the two. The demarcation starts at the nostril, passes through the eye and just behind the fold to the inner side of the elbow, thence out along the dorsal surface of the forearm to the inner side of the third finger; the tops of third and fourth fingers have the dorsal ground color. The line of demarcation then runs from the outer side of the little finger around the elbow to the axilla, along the side to the groin, along the face of the thigh and shank, thence along the foot to the base of the fifth toe; posteriorly it runs through the vent, along the posterior surface of the thigh to the inner side of the knee, thence to the ankle and along the margin of the fifth toe to its tip. Thus the dorsal surface of the fifth toe is the only one with dorsal ground color. Above, the only pattern is a very thin pale hairline running from tip of snout to vent. Below, the entire ventral surface is flecked with pale spots, these being a little larger on the breast. The dark ground color on the inner face of shank and inner face of ankle is heavily marbled with white.

Remarks.—Specimen FM 357 from Serranía de La Macarena confirms that *Ctenophryne geayi* is in reality a Colombian species and adds additional credibility to the type locality as cited by Mocquard. Dunn (1949, p. 18) has pointed out that the Río Sarare actually arises on the southeast slope of Páramo de Tamá in Norte de Santander and flows for about eight miles through Colombian territory before it crosses into Venezuela. It is Dunn's supposition that the type was collected by a member (French?) of the boundary commission, which certainly visited the spot where the Sarare crosses the border and there established the altitude (640 m.).

The few specimens available do not throw much light on individual variation, but they do indicate that the species is rather widespread. The absence of the clavicles and procoracoids and the webbing on the toes set this species off rather sharply from all Colombian microhylids except *Glossostoma aterrimum*. Thus in Colombia there is only one web-footed microhylid east of the Cordillera Oriental of the Andes (*Ctenophryne geayi*) and one west of it (*Glossostoma aterrimum*). The presence of the palatine bones in *Glossostoma* and the quite different habitus of the two genera make them readily separable.

The presence of webbed feet, a rather pale brown dorsum with a middorsal pale hairline, and a venter of a brown darker than the dorsum and separated from it by a rather sharp line of demarcation seem to be rather uniform traits of the species.

Specimens Examined

COLOMBIA
- Norte de Santander: Río Sarare, MHNP 03-84 (holotype).
- Meta: Serranía de La Macarena, FM 357.

BRAZIL: Amazonas, region of Río Livranents, AMNH 44787; Manjuru (region of Maués, middle Amazon), AMNH (unnumbered specimen).

BRITISH GUIANA: Kartabo, AMNH 23119, 71399, USNM 129533.

PERU: Inguitos, 350 ft., AMNH 42887; Peru-Brazil frontier (Utaquinia-Tapiche), AMNH 42685; Pampa Hermosa, Río Cushabatay, 500 ft., AMNH 42663.

Genus *Otophryne* Boulenger

1900. *Otophryne* Boulenger, p. 55 (type species, *Otophryne robusta* Boulenger).

Generic diagnosis.—Clavicle and procoracoid present and nearly straight. Palatines absent. Tympanum distinct.

Only one species is known from Colombia.

Otophryne robusta Boulenger

Figure 5

1900. *Otophryne robusta* Boulenger, p. 55 (type locality, Mt. Roraima, British Guiana).—Nieden, 1926, p. 73.—Noble, 1931, p. 536.—Parker, 1934a, p. 108.—Dunn, 1949, p. 2.—Carvalho, 1954, p. 3.—Rivero, 1961, p. 179.—Gorham, 1963, p. 26.

Diagnosis.—Tympanum distinct; clavicle and procoracoid straight and perpendicular to midline of pectoral girdle; palatine absent.

Otophryne robusta can be easily distinguished from all Microhylidae now known from Colombia by its distinct tympanum and the straight clavicles and procoracoids which are perpendicular to the midline of the pectoral girdle. All other Colombian species have the tympanum concealed; and the clavicles and procoracoids, if present, are strongly curved.

Description.—FM 89, from lower Río Apaporis, Amazonas, Colombia. A microhylid without vomerine teeth; choanae moderate in size, laterally ovate and lying well forward in the mouth; tongue not more than half as wide as mouth opening, elongate, its posterior border free and unnotched. Snout rather large for a microhylid, somewhat truncate when viewed from above, quite pointed in profile, the upper jaw extending very considerably beyond lower; nostrils lateral, not visible from dorsal view, not projecting, their distance from end of snout slightly more than one-half that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis sharply defined; loreal region flattened and flaring inward toward the upper lip. Eye rather large for a microhylid, moderately prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about three times the width of upper eyelid, which is even less than the distance between nostrils. Tympanum very distinct, its diameter about equal to greatest diameter of eye, separated from eye by a distance less than one-fourth its own diameter. Fingers without a trace of web at base, fourth finger but slightly longer than second, just reaching to base

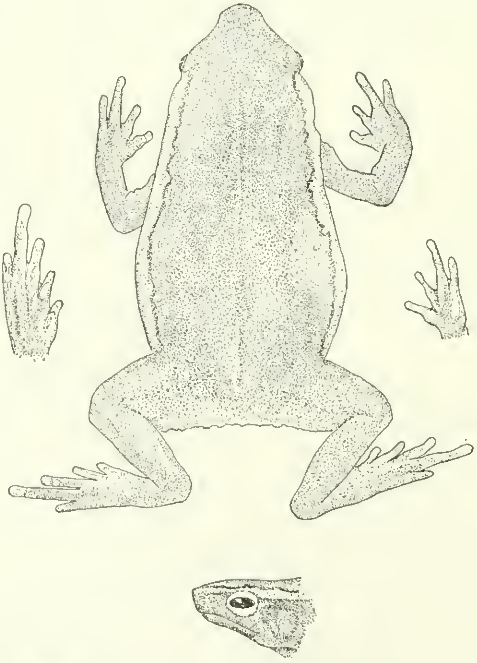

Figure 5.—*Otophryne robusta,* FM 89 (same size).

of penultimate phalanx of third; digital tips not expanded; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly webbed at base; the web on fourth toe reaching the base of the antepenultimate phalanx, third toe much longer than fifth; metatarsal tubercles not present; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region slightly broader than greatest width of head; when hind leg is adpressed, heel reaches axillary region; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels fail to meet by internarial distance. Skin of upper parts smooth. A narrow dorsolateral fold passes from above the tympanum to the region of the groin on each side. A rather narrow glandular ridge encircles upper part of tympanum. Skin of throat, chest, and belly smooth; no trace of a skinfold across chest; adult female, no vocal sac. Abdomen packed with large, unpigmented eggs.

Dimensions.—Head and body 51.7 mm.; head length 17 mm.; head width, 18.3 mm.; femur, 19.1 mm.; tibia, 11.8 mm.; heel-to-toe, 25 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum uniform dark brown medially. A pale, narrow, cream-colored stripe extends from eye to eye around the tip of snout, passing just above the nostrils. This stripe widens appreciably just behind each eye and passes posteriorly on each side above the tympanum in the form of a broad, cream-colored dorsolateral stripe all the way to the groin, where it again narrows and passes along the anterior faces of the thigh and shank as a narrow cream-colored stripe. Posterior side of thigh dark with light mottlings arranged more or less in the form of a stripe. Lower surfaces somewhat paler than dorsum, darkest under the chin and throat, becoming paler posteriorly. Indistinct but discrete, rounded, scattered, brown ocelli-like dots on the chin, throat, and chest.

Remarks.—This very distinctive genus is still, to the best of our knowledge, known from only four specimens—the type; a specimen in the American Museum (AMNH 1325) which has no data other than that it was obtained from the museum in Georgetown, British Guiana; a specimen in the University of Michigan collection (MZUM 85137) from Arabopó, Venezuela; and the specimen, described above, from the lower Río Apaporis in Colombia.

This is surely the most distinctive microhylid in South America. The large, conspicuous tympanum and the very flat-topped head set it off at a glance from all others.

The specimen at hand, a gravid female, has the abdomen packed with large, unpigmented eggs, a condition usually associated with terrestrial breeding habits.

We have not examined the type of this species, but from available descriptions we judge that our specimen at hand differs in three respects: dorsolateral stripes; dorsolateral folds; and dark on the posterior face of the thighs, with light markings arranged in the form of a narrow stripe. The dorsolateral stripes are quite distinct and the way they pass through the groin and onto the anterior surfaces of the thigh and shank is unique among the frogs known to us. The dorsolateral folds are narrow and sharp and, on gross examination, seem to lack the glandular structure such as one finds in *Rana*, for example, but they are too uniform and symmetrical to permit us to believe that they are merely artifacts of preservation. The type is described as having the groin and hinder surfaces of the thighs orange with black spots. In the specimen from Colombia, the groin is dark except for the dorsolateral stripe that passes through it and the hind surface of the thigh is likewise black except for the narrow stripe formed by confluent light markings.

The specimen from Colombia has been rather grossly dissected and we cannot now find any sign of an omosternum such as is illustrated by Parker (1934a, fig. 46). The condition of the girdle, however, does not permit us to state categorically that one was never present for a small one such as Parker illustrates may well have been inadvertently removed in the process of cleaning the girdle. Hence, like Dunn (1949) and Carvalho (1954) we cannot confirm the presence of an omosternum in this genus.

Specimens Examined

COLOMBIA

Amazonas: Lower Río Apaporis, FM 89.

VENEZUELA: Arabopó, MZUM 85137 (photograph).

Suborder PROCOELA

Vertebral column procoelous, although sometimes free intervertebral disks are formed. Pectoral girdle usually arciferal, with posteriorly projecting epicoracoid horns always present. Epicoracoids sometimes more or less fused. Urostyle articulates with sacral vertebra by a double condyle (sometimes urostyle and sacrum are fused). Ribs never present.

Family Pseudidae

Each digit possessing an extra phalanx. Sacral diapophyses cylindrical. Maxillary teeth present. Thumbs opposable to other digits. Reproduction aquatic; eggs are laid in a frothy mass. In *Pseudis paradoxa* the tadpole may be nearly four times the length of adult.

Genus *Pseudis* Wagler

1830. *Pseudis* Wagler, p. 203 (type species, *Rana paradoxa* Linnaeus).

Generic diagnosis.—Pupil horizontal. Tongue circular, entire and slightly free behind. Vomerine teeth present. Tympanum distinct. Fingers free, first finger opposable to the others; toes completely webbed; tips of all digits pointed or swollen into small disks. Outer metatarsals separated by a web. Omosternum cartilaginous; sternum a cartilaginous plate. Terminal phalanges simple.

***Pseudis paradoxa nicefori*, new subspecies**

PLATES 12G, 68A–C

Holotype.—MLS 443, an adult from Montería, Córdoba, Colombia, collected by Hno. Nicéforo María, February 22, 1966.

Paratypes.—USNM 145076 (larva), Río San Jorge, between Lagunas Puerco and Sabanas, Bolívar; USNM 145780 (larva), Ríoviejo, lower Río Magdalena, Bolívar; CNHM (larva), Válledupar, Badillo, upper Río César, Magdalena.

Diagnosis.—Vomerine teeth in two large, transverse, well-separated series between the choanae; greatest diameter of tympanum equal to that of eye and equal to distance from eye to nostril; a thick glandular ridge from posterior corner of eye, continuing above tympanum and shoulder to fade out behind the level of the axilla; lower surface of femur with heavy gray reticulations enclosing pale round or oval and sometimes irregular areas, with a wide pale stripe along anterior surface of femur above the reticulations; lower surface of tibia pale with a few thin gray vermiculations; venter olive-buff with some small gray spots on throat, more definitely aligned along center of chest; a large triangular light spot outlined with gray below shoulder attachment; belly immaculate; back with two very irregular longitudinal rows of darker spots on each side (one row near the midline, the other in the dorsolateral area); a large light transverse spot immediately behind anus and a second smaller patch behind it.

Description of holotype.—Vomerine teeth in two very heavy, transverse, well-separated series between the choanae; tongue two-thirds as wide as mouth opening, deltoid, attached except on its extreme border, which is straight; snout moderately short, rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils superior, slightly projecting, their distance from end of snout almost as great as their distance from eye. Canthus rostralis indistinct; loreal region barely concave, sloping broadly to the upper lip. Eye moderate in size, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter twice that of upper eyelid, equal to interval between nostrils. Tympanum large, its greatest diameter equal to that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers long, slender, the first and second fingers with short lateral ridges, free, first finger opposable to and shorter than second, fourth longer than either, reaching to base of penultimate phalanx of third; tips of fingers not enlarged; a flat oval thumb pad present; a smaller round palmar callus; metacarpal tubercles small but well developed. Toes entirely webbed, third toe longer than fifth, whose tip reaches to center of penultimate phalanx of fourth; toe disks slightly bulbous; a heavy, crescentic inner metatarsal tubercle, not hooked; no outer one; a thick tarsal ridge, ending near heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts heavily glandular, but without granules except for a few small indistinct ones on sacrum; venter smooth, with fine transverse skinfolds across throat, chest, and belly; a thick glandular ridge from posterior corner of eye above tympanum, continuing above shoulder and fading out behind the level of axilla; no heavy skinfold across the chest; no ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 51 mm.; head length, 14.5 mm.; head width, 17.5 mm.; femur, 26 mm.; tibia, 27 mm.; foot, 25 mm.; hand, 15 mm.

Color in alcohol.—Top of head and back slate color with indistinct darker spots in irregular rows, one near midline, the other in dorsolateral area; upper surfaces of limbs smoke-gray, the femur and tibia with indistinct darker bars; venter olive-buff, with some small gray spots on throat, more definitely aligned along center of chest; a light irregular triangular spot outlined with dark gray below attachment of shoulder; belly immaculate olive-buff; lower limb surfaces pale buff, with a heavy gray reticulation on lower femur, enclosing round, oval and sometimes irregular pale areas, and a wide pale stripe above this reticulation along anterior surface of femur; lower part of tibia and top of foot pale, with a few thin gray vermiculations; posterior surface of femur slate-black with numerous small rounded white spots; a larger white patch below anus, preceded by a longer transverse one reaching almost to middle of femur; upper lip smoke-gray with a few faint darker spots, then merging with the slate color of loreal and subocular regions; soles of feet pale gray on three inner toes, slate color on outer two, the webs pale but finely vermiculated with slate, palms of hands pale smoke-gray on inner two fingers, dark on outer two; sides of body slate above, pale olive-buff below, with a few small pale dots invading the slate area.

Remarks.—Two large tadpoles from the Magdalena River drainage in Bolívar have well-developed hind legs. The lower surface of the femur has two large, light, irregularly oval white spots in a very wide dark stripe. A third tadpole, from the upper Río César in Magdalena, has two wide irregular light subfemoral stripes invaded by a few dark spots and separated by a wide, light-spotted dark stripe. The receiving of the tadpoles from Bolívar (in 1961) and of the one from Magdalena was sufficient cause to postulate the occurrence of a new subspecies from northern Colombia, since the pattern of their lower femoral surfaces differed from the other forms of *Pseudis paradoxa* so well discussed by Gallardo (1961a). The examination of the single adult from Córdoba collected by Hno. Nicéforo María established the new form beyond a doubt, and it gives us great pleasure to name it for its collector.

Family BUFONIDAE

Shoulder girdle arciferal, or epicoracoids partly fused. Sacral diapophyses dilated. Number of vertebrae tending to be reduced, apparently resulting from a forward shift of the sacral articulation, with the original sacral vertebrae perhaps becoming incorporated into the urostyle. Omosternum usually absent. No maxillary teeth. Bidder's organ present in male.

Genus *Bufo* Laurenti

1768. *Bufo* Laurenti, p. 25 (type species, *B. vulgaris* Laurenti).

Generic diagnosis.—No maxillary or vomerine teeth. A parotoid gland present. Shoulder girdle arciferous. Lateral sacral processes dilated.

Key to Colombian Species of *Bufo*

a^1. Bony head ridges present, more or less prominent.
  b^1. Upper eyelid with a hornlike projection; size to 35 mm . . **B. ceratophrys**
  b^2. No horn on upper eyelid.
    c^1. Snout extended to a proboscis in adult.
      d^1. Adpressed heel reaching angle of jaw or a little farther; toes three-fourths webbed; parotoid triangular, not longer than eye; headcrests including parietal strongly developed; size to 42 mm. **B. rostratus rostratus**
      d^2. Adpressed heel reaching axilla or front of shoulder; toes about one-fourth webbed; parotoid oval, 1½ times diameter of eye; headcrests wide and swollen; size to 34 mm . . . . **B. rostratus nicefori**
    c^2. Snout not proboscis-like, but often pointed and projecting in *typhonius*.
      d^1. A subnasal ridge; nostrils dorsal, projecting; tympanum touching downward extension of postorbital ridge.
        e^1. Toes moderately long, one-half webbed . . **B. granulosus humboldti**
        e^2. Toes rather short, one-fourth webbed . . . . **B. granulosus beebei**

d^2. No subnasal ridge; nostrils lateral or superolateral; tympanum not usually touching postorbital ridge.
  e^1. Angles of jaw projecting in adult; headcrests often greatly developed in old adults and involving the parotoids anteriorly; soles of feet spinose; size to 70 mm . . . . **B. typhonius**
  e^2. Angles of jaw not projecting; head ridges heavy but not unusually developed.
    f^1. Parotoids large; a tarsal fold present.
      g^1. Skin granular to spinose; size to 157 mm . . . . **B. marinus**
      g^2. Skin glandular, nearly smooth; size to 212 mm . **B. blombergi**
    f^2. Parotoids moderate; no tarsal fold.
      g^1. Supraorbital and postorbital ridges forming a right angle; size to 90 mm . . . . **B. coniferus**
      g^2. Supraorbital and postorbital ridges forming a wide curve; size to 43 mm . . . . **B. sternosignatus**
a^2. No bony ridges on top of head.
  b^1. First finger as long as or longer than second.
    c^1. Tarsal fold lacking or indistinct; toes one-half webbed, or a little more; tarsometatarsal joint reaching a point between eye and nostril; size to 145 mm . . . . **B. glaberrimus**
    c^2. Tarsal fold distinct; toes one-fourth to one-third webbed; tarsometatarsal joint reaching beyond snout; size to 90 mm . . **B. haematiticus**
  b^2. First finger shorter than second; toes one-half webbed; size to 23.5 mm. **B. hypomelas**

Bufo ceratophrys Boulenger

PLATE 14A–C

1882. *Bufo ceratophrys* Boulenger, 1882a, p. 319, pl. 22, fig. 2 (type locality, Ecuador).—Gadow, 1901, p. 179.—Nieden, 1923, p. 141.—Rivero, 1961, p. 22.—Gallardo, 1962, p. 96.—Gorham, 1963, p. 15.

Description.—MLS 50, a half-grown individual from Aserrío, Caquetá, Colombia. Bony ridges on top of head limited to rounded crests at inner borders of upper eyelids. Parotoids small. Tongue one-third as wide as mouth opening, slender, oval, its posterior border free and unnotched; snout 3-lobed when viewed from above (a central lobe, and one above each nostril), truncate and slanting backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, very small but projecting, their distance from end of snout one-fourth their distance from eye. Canthus rostralis sharp, angulate; loreal region flat, vertical, merging into the nearly vertical upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter about three-fourths that of upper eyelid (including the greatly prolonged "horn" on outer edge of eyelid) and equal to interval between nostrils. Tympanum very small, not very distinct, its greatest diameter apparently about one-third that of eye, separated from eye by an interval equal to nearly its own diameter. Fingers without disks, moderate, with lateral ridges, free, first finger a trifle longer than second and equal to fourth, which reaches to base of penultimate phalanx of third; an oval projecting thumb pad present; a small rounded palmar callus; metacarpal tubercles well developed. Toes without disks, webbed at the base, third toe a trifle longer than fifth, its tip reaching to base of antepenultimate phalanx of fourth; a small, pointed metatarsal tubercle and a smaller round outer one; a distinct outer tarsal ridge edged with small tubercles, ending at heel, and a similar but smaller inner one; a pronounced skinfold on heel and knee; soles granular. Body short and stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts with minute tubercles and granules, enlarged along middorsal line, on top of head, and on sacrum; a heavy lateral fold beginning at posterior corner of eye, widening to an elongate parotoid gland, and becoming narrower but still quite distinct and set with tubercles from axilla to groin; throat and chest faintly granular; belly and lower proximal femur distinctly but finely granular; no glandular ridge from posterior corner of eye above tympanum, its place being taken by the parotoid and lateral tubercles; a slight skinfold across the chest; no ventral disk; no external vocal sacs.

Dimensions.—Head and body, 23 mm.; head length, 8 mm.; head width, 8 mm.; femur, 10 mm.; tibia, 10.5 mm.; foot, 8.5 mm.; hand, 6.5 mm.

Remarks.—Upon direct comparison, MLS 50 and the type (BM 80.12.5.151) are certainly conspecific. The type is larger (35 mm.) and now somewhat softer, but otherwise the two specimens are very similar. Even the dorsal pattern is strikingly similar in the two specimens, although in the type it is somewhat more faded than in the fresher Colombian specimen. The bony ridge on the inner and posterior sides of the orbit is more pronounced in the type, but this most likely is due to its greater age. The parotoid glands on the type are more conspicuous, but this also probably is due to age. The bandings on the arms and legs of the two specimens are essentially identical.

Specimens Examined

COLOMBIA
  Caquetá: Asserío, MLS 50.
EDUADOR: BM 80.12.5.151 (type).

Bufo rostratus rostratus Noble

Plate 14d–f

1920. *Bufo rostratus* Noble, p. 445 (type locality, Santa Rita Creek, 14 mi. north of Mesopotamia, Antioquia, Colombia).—Gallardo, 1962, p. 96.—Gorham, 1963, p. 16.

Description.—AMNH 1384, female paratype from Santa Rita Creek, 14 miles north of Mesopotamia, Antioquia, Colombia. Heavy bony ridges on top of head beginning at prolonged tip of snout, diverging to border inside of upper eyelid, dividing at posterior inner edge of eyelid, the inner ridges converging and disappearing on the back above the shoulders, the outer ridges bordering the eye behind transversely, turning backwards at a right angle above tympanum, and continuing as a series of sharp, conical tubercles along side of body to groin; parotoid glands rather small, subtriangular; tongue very long and slender, less than half as wide as mouth opening, ovate, its posterior border free and slightly notched; snout pointed when viewed from above and in profile, the upper jaw extending far beyond the lower due to the elongate snout tip. Nostrils lateral, projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis very sharp; loreal region concave, vertical, sloping a little to meet the upper lip. Eye large prominent its diameter two-third its distance from tip of snout; interorbital diameter 2½ times that of upper eyelid, almost twice the interval between nostrils. Tympanum hidden. Fingers one-third webbed, with lateral ridges, first finger shorter than second, fourth longer than either, and reaching nearly to penultimate phalanx of third; an oval thumb pad present; a round palmar callus; metacarpal tubercles well developed, the proximal ones divided. Toes short, three-fourth webbed, 3rd and 5th toes subequal, their tips reaching to base of antepenultimate phalanx of 4th toe; an oval inner metatarsal tubercle, and an outer one nearly equal to it in size; an outer tarsal ridge bordered with conical tubercles; a series of skinfolds on heel and knee; soles granular. Body stout, in postaxillary region a little less than greatest width of head. When hind leg is adpressed, heel reaches to angle of jaw; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels are slightly separated. Skin of upper parts with small granules and scattered larger conical tubercles, the latter more apparent between shoulders, on sacrum, and on upper limb surfaces; venter finely granular everywhere; no skinfold across chest; no ventral disk; an external vocal sac in the male.

Dimensions.—Head and body, 36.5 mm.; head length, 13 mm.; head width, 13.5 mm.; femur, 13 mm.; tibia, 13.5 mm.; foot, 10 mm.; hand, 9 mm.

Color in alcohol (from Noble's original description of the type)—Color above yellowish brown, indistinctly marked with darker brown, forming crossbands on the legs; ventral surfaces yellowish white reticulated with dark brown.

Remarks.—In Noble's diagnosis, the type is said to have the fingers one-third webbed and the toes three-fourths webbed. But Noble's detailed description states that the fingers are "webbed only a little beyond the metacarpals, but the web extending into the metacarpal region making the fingers appear about one-third webbed, the web continued along the edges of the fingers as a narrow seam." This "narrow seam" has been called the "lateral ridge" in the present paper. Noble further states that the toes are "about three-fourths webbed, the web extending to the end of the phalanx of the two inner toes, to the base of the last phalanx of the third and fifth toes, and to the base of the antepenultimate of the fourth toe; web continued as a seam to the tips of all the toes . . . ."

Noble believed that his *rostratus* was related to *Bufo coniferus* Cope. When Myers and Leviton publish the results of their current studies on *coniferus* and its allies, we shall have a broader conception of the status of these toads.

Specimens Examined

COLOMBIA

ANTIOQUIA: Santa Rita Creek, 14 mi. north of Mesopotamia, AMNH 1359 (holotype), 1384 (paratype).

Bufo rostratus nicefori, new subspecies

PLATE 15D–F

Holotype.—USNM 163476, an adult from El Chaquiro, Antioquia, collected by Hno. Nicéforo María in December 1966.

Paratypes.—MLS 449–52, same data as holotype.

Diagnosis.—Snout bluntly pointed at tip and projecting; supraorbital ridges coarse and heavy, top of head between them appearing concave. Tympanum hidden. Dorsolateral tubercles large and blunt, extending to groin. Toes one-fourth to one-third webbed. Finger short, heavy, distinctly webbed at base. Hind leg short, adpressed heel reaching axilla or front of shoulder.

Description of holotype.—A pair of heavy, nearly parallel crests beginning between the eyes and continuing back on the parietal region; tongue about half as wide as mouth opening, very elongate, its posterior border free and unnotched; snout proboscis-like, the tip elongate and rounded when viewed from above, bluntly pointed in profile, lower surface of proboscis smooth and rounded, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis swollen, continuous with the rostrum; loreal region weakly concave, sloping a little towards the upper lip. Eye large, prominent, its diameter slightly less than its distance from tip of snout; interorbital diameter twice that of upper eyelid, greater than interval between nostrils. Tympanum covered. Fingers fairly short broad, flattened but without true lateral ridges, with faint traces of a web, first finger shorter than second, fourth longer than either, reaching halfway on penultimate phalanx of third; a small rounded thumb pad present; a larger flat palmar callus; metacarpal tubercles not very distinct. Toes broad, short, one-fourth webbed, third and fifth toes subequal, their tips reaching to base of antepenultimate phalanx of fourth; a small round inner metatarsal tubercle and a smaller outer one; no apparent tarsal ridge; a thick skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches axilla; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts thickly covered with rounded tubercles in three rows (the largest tubercles in a row along dorsolateral line, two less-distinct rows are on each side of midline); venter granular, with large and small granules mixed on the belly and very small ones on throat; a very thick glandular ridge from posterior corner of eye ending in the short round parotoid; no skinfold across the chest; no ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 34 mm.; head length, 11.5 mm.; head width, 12 mm.; femur, 11.5 mm.; tibia, 11 mm.; foot, 10 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum immaculate clove brown; side of head and body clove brown to sepia; belly wood brown with sepia suffusions, throat paler in the center, darkening to clove brown around edge of jaw; posterior femur clove brown above lightening to drab below; palms of hands and soles of feet dull sepia. [The collector notes that the two toads were nearly black when alive.]

Remarks.—The four paratypes are much like the type in structure, except that in one example the adpressed heel reaches the front of the shoulder and the toes are one-third webbed. The belly may be mottled seal brown and sepia, or olive to dull buff with somewhat more distinct dark dots. One of the paratypes appears to have a partial light midventral line, and three have narrow light middorsal lines. The back is very dark in all the individuals, with none of the dorsal spotting characteristic of *Bufo typhonius*. In *typhonius* it is the postocular and supratympanic crests that are frequently over-developed in old adults; in the *rostratus* forms it is the nasal and supraocular regions that show most specialization. *Bufo ceratophrys* Andersson and *B. dapsilis* Myers and Carvalho likewise suggest an interrelationship with *B. typhonius* and *B. rostratus*. Numerous differences exist, however, and, upon close examination, even an unusually long-snouted *typhonius* can scarcely be mistaken for a form of *rostratus*.

The legs of *B. rostratus nicefori* are extremely short, with femoral and tibial lengths falling below the extreme lower limits of the others. Nominate *rostratus* has longer legs, although the proportions of its femur and tibia to total length are overlapped by the Ecuadorean *B. dapsilis*.

Bufo granulosus beebei **Gallardo**

PLATE 68D–F

1922. *Bufo granulosus* (not of Spix).—Ruthven, 1922, p. 55 (part).—Lutz, 1927, p. 38, pl. 16, figs. 5, 6.—Parker, 1933, p. 11; 1936, p. 1.—Beebe, 1952, p. 174.—Lynn, 1959, p. 113.
1927. *Bufo globulosus* (not of Spix).—Lutz, 1927, p. 42, pl. 8, figs. 5, 6; 1934, p. 124 (part), pl. 25.
1965. *Bufo granulosus beebei* Gallardo, p. 114, figs. 1, 2, maps (type locality, Churchill-Roosevelt Highway, Trinidad, B. W. I.).

Description.—MZUM 45527, from Gaira, Magdalena, Colombia. Bony ridges on top of head encircling eye, along canthus and below nostril, above and below tympanum, and (a short one) on parietal region. Tongue two-fifths as wide as mouth opening, oval, its posterior border free and unnotched; snout broadly rounded at the tip when viewed from above, rounded in profile, the upper jaw extending far beyond the lower. Nostrils more dorsal than lateral, projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis concave; loreal region concave, descending nearly vertically to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid and twice the interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to half its own diameter. Fingers moderately long, with weak lateral ridges, free, first finger shorter than second, fourth longer than either, its tip reaching to base of antepenultimate phalanx of third; a small oval thumb pad present; a much larger round palmar callus; metacarpal tubercles well developed, the distal ones mostly double. Toes rather short, one-fourth webbed, third toe longer than fifth, its disk reaching to center of antepenultimate phalanx of fourth; a small pointed oval inner metatarsal tubercle, and a smaller oval outer one; no distinct tarsal ridge; a skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches axilla; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels touch. Skin of upper parts granular, the granules on head and along dorsolateral region larger; venter finely granular, with a large patch of fine irregular wrinkles on posterior part of belly and on proximal femoral surface;

a heavy glandular ridge from posterior corner of eye above tympanum, ending at parotoid, which is small and nearly triangular; a few pointed spicules below tympanum and beneath eye; a fine ridge along rim of upper jaw; no skinfold across the chest; no ventral disk; an external median vocal sac in the male.

Dimensions.—Head and body, 43 mm.; head length, 12 mm.; head width, 14.5 mm.; head height, 6.5 mm.; femur, 14 mm.; tibia, 15.5 mm.; foot, 14 mm.; hand, 11 mm.

Color in alcohol.—Dorsum wood brown with a pair of small oval sepia spots between the shoulders, another crescent-shaped pair at the beginning of the sacrum, and numerous smaller sepia spots surrounding the enlarged tubercles along dorsolateral region and nape; upper limb surfaces drab with sepia markings on top of femur, and two large sepia spots on upper surface of tibia and foot; side of head ecru drab, the spicules around eye, nostril, and upper lip dark; side of body drab above fading to dull clay color below with a few indistinct sepia spots in upper part; venter immaculate clay color; posterior surface of femur drab to clay color with two or three indistinct darker spots; palms of hands and soles of feet pale clay color, the tips and tubercles darker.

Remarks.—Some of the minute differences by which Gallardo (1965) distinguishes *B. granulosus humboldti* from *B. g. beebei* are partially confirmed by comparing critical measurements of head width and head height. In *humboldti* the head width is a little greater, while the head height tends to be a little more than in *beebei* although they slightly overlap. The snout, said to be "elongate" in *beebei* and "short" in *humboldti*, is really of about the same proportion in both forms in relation to percentage of head-and-body length.

Specimens Examined

COLOMBIA
MAGDALENA: Gaira, MZUM 45527.
TRINIDAD: St. Augustine, USNM 141533.
VENEZUELA: Maracay, USNM 97193–5.

***Bufo granulosus humboldti* Gallardo**

PLATE 13A–C

1899. *Bufo granulosus* (not of Spix).—Cope, 1899, p. 1.—Ruthven, 1922, p. 55 (part).—Noble, 1924, p. 66.—Dunn, 1944, p. 513.—Stebbins and Hendrickson, 1959, p. 514.

1965. *Bufo granulosus humboldti* Gallardo, p. 117, fig. 9, maps (type locality, Gualanday, west of Girardot, Tolima, Colombia).

Description.—USNM 146815, an adult male from Villavicencio, Meta, Colombia. A narrow but sharp bony ridge encircling eye, with a prolongation forward and inward along the canthus rostralis, and another back of eye to the small parotoid. Snout short, rounded; tongue about one-third as wide a mouth opening, oval, its posterior border free and unnotched; snout truncate at tip when viewed from above, projecting in profile, the upper jaw extending well beyond the lower. Nostrils dorsal, strongly projecting, their distance from end of snout one-half their distance from eye, with a subnasal ridge. Canthus rostralis sharp, curved; loreal region concave, slanting outwards to the upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, much greater than interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to about one-third its own diameter, but touching postorbital crest. Fingers fairly long; with lateral ridges, faintly webbed at base, first and second fingers subequal, fourth finger slightly longer than either, reaching to base of penultimate phalanx of third; a small oval thumb pad present; a large round palmar callus; metacarpal tubercles well developed. Toes moderately long, one-half webbed, third toe slightly longer than fifth, its disk reaching nearly to base of antepenultimate phalanx of fourth; a small oval inner metatarsal tubercle and a smaller round outer one; no distinct tarsal ridge; a heavy skinfold on heel and knee; soles granular. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches just beyond axilla; when limbs are laid along the sides, knee and elbow are slightly separated; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts tubercular, the tubercles on top of head smaller and flatter; parotoid gland short, slightly longer than eye, broadly triangular; venter finely granular, with transverse folds across abdomen; a short coarse glandular ridge from posterior corner of eye above tympanum, ending at parotoid; a narrow crest curving inward from nostrils then outward to anterior eye, encircling eye, continuing as a broad but weak posterior occipital crest; another narrow crest bordering upper lip from eye to snout tip; no skinfold across chest; no ventral disk; a median external vocal sac in the male; first fingers of male are roughened in breeding season.

Dimensions.—Head and body, 41 mm.; head length, 13 mm.; head width, 15 mm.; femur, 13.5 mm.; tibia, 14.5 mm.; foot, 14.5 mm.; hand, 10.5 mm.

Color in alcohol.—Dorsum wood brown with large irregular clove brown spots which are more or less transverse between the eyes and are chevron-shaped on the back; side of head wood brown, the crests outlined in clove brown; side of body wood brown with small dark brown spots fading out below; venter light wood brown, immaculate (in this specimen) except for a dark suffusion on the throat of the male; limbs pale wood brown above with coarse clove brown spots, which form three irregular crossbars on tibia, foot, and forearm; posterior femur wood brown with dark spots which fade out below; soles of feet and palms of hands ecru drab, the toe tips and tubercles sepia.

Remarks.—The males can be distinguished by the brown patches of rough scales on the inner surface of the first finger in breeding season. In the present series, the smallest specimen to display the brown patches is USNM 146636, measuring 38.5 millimeters in total length. The larger and more circular tympanum also is a prevalent characteristic of the male of this subspecies. In some males the vocal sac extends as far back as the armpits.

The dark spotting of the belly apparently has no regional significance, as both spotted and unspotted bellies occur in toads from the northern, central, and southern states of Colombia.

The very short femur, tibia, and hand distinguish members of the *granulosus* group from other Colombian toads. The peculiar shape of the snout in *granulosus* is likewise an identifying character. The species has several distinct forms in different regions of South America. These forms have been studied most recently by Gallardo, who has called most of the Colombian toads *humboldti*, with the single exception of one from Guaira, Magdalena, which he records as *beebei*. Differences are very slight between these two forms, but the former subspecies has a slightly greater head width and head height. Only the comparison of large series of *beebei* with *humboldti* can confirm or repudiate their validity.

Specimens Examined

COLOMBIA

Antioquia: Casabe, USNM 146814.

Atlántico: Río César, USNM 117515.

Bolívar: Sincelejo to Tolú, USNM 150733–41.

Córdoba: Caño Betancí, Junquilla, USNM 144571.

Cundinamarca: Melgar, USNM 146635–6; Tocaima, El Cucharo, 380 m., USNM 146201.

Guajira: One-half mile south of Pájaro, USNM 151292–302; Sierra Macuira, USNM 115380; Piojo, 100 m., USNM 152688–93.

Magdalena: Ciénaga, USNM 144153; lower Río Manzanares, between Santa Marta and Mamatoca, 30–60 m., USNM 150892; Finca El Aranar, Bonda, USNM 152735–49.

Meta: "La Cristalina," edge of Caño Losada, Sabana, USNM 144572; Villavicencio, USNM 144573, 146815; 7 km. northeast of Villavicencio, USNM 146385–9; Sierra de La Macarena, Caño Guapaya, USNM 147266–7.

Norte de Santander: Astillero, USNM 146816–7.

Tolima: Mariquita, USNM 144574–83, 150151–3; Melgar, USNM 148135.

Valle: Río Calima near Córdoba, USNM 145773.

Vaupés: Amanavén, Boca del Río Guaviare, USNM 144584.

PANAMA: Río Calobre, USNM 53739; Fort Kobbe, Canal Zone, USNM 140493.

***Bufo typhonius* (Linnaeus)**

Plate 14g–i

1758. *Rana typhonia* Linnaeus, p. 211 (type locality, America).—Gmelin, 1789, p. 1050.—Shaw, 1802, p. 159, pl. 45.
1768. *Rana margaritifera* Laurenti, p. 30 (type locality, Brazil).—Gmelin, 1789, p. 1050.
1799. *Bufo typhonius.*—Schneider, 1799, p. 207.—Merrem, 1820, p. 181.—Peters, 1873a, p. 226.—Boulenger, 1882a, p. 317, fig.; 1884a, p. 637; 1898a, p. 123; 1898b, p. 132; 1903a, p. 69; 1913, p. 1022.—Günther, 1901, p. 253.—Werner, 1901, p. 600.—Steindachner, 1901, p. 111.—Lidth, 1904, p. 93.—Peracca, 1904, p. 36.—Despax, 1911, p. 43.—Baumann, 1912, p. 97, fig. A; 1917, pp. 132, 143.—Fowler, 1913, p. 153.—Ruthven, 1919, p. 8.—Beebe, 1919, p. 207; 1925, p. 125.—Barbour and Noble, 1920, p. 425.—Procter, 1921; p. 191.—Nieden, 1923, p. 139.—Cott, 1926, p. 1159.—Brazil and Vellard, 1926, p. 23.—Parker, 1926, p. 554; 1934c, p. 266; 1935, p. 509; 1938, p. 439.—A. Lutz, 1927, p. 40; 1934, pp. 130, 156.—Ahl, 1929, p. 149, photograph.—De Witte, 1930, p. 17.—Hno. Nicéforo-María, 1930b, p. 104.—Crawford, 1931, p. 29.—Crawford and Jones, 1933, p. 88.—Müller and Hellmich, 1936, p. 20, fig. 6.—Hellmich, 1939, p. 537.—Andersson, 1939, p. 19; 1945, p. 61.—Mello-Leitão, 1937, p. 292.—Melin, 1941, p. 16.—Travassos and Freitas, 1942, p. 282.—Dunn, 1944a, p. 69; 1944c, p. 513; 1944d, p. 399.—Lutz and Kloss, 1952, p. 635.—Goin and Layne, 1958, p. 102.—Stebbins and Hendrickson, 1959, p. 519.—Ginés, 1959, p. 118, fig.—Gans, 1960, p. 299.—Gallardo, 1962, p. 96.—Gorham, 1963, p. 16.
1799. *Bufo nasutus* Schneider, p. 217 (type locality, Brazil).
1802. *Bufo margaritifer.*—Daudin, 1802, p. 89, pl. 33, fig. 1; 1803, p. 179.—Duméril and Bibron, 1841, p. 718.—Steindachner, 1867, p. 47.—Cope, 1874b, p. 120; 1887a, p. 45.
1824. *Oxyrhynchus naricus* Spix, p. 49, pl. 14, fig. 2 (type locality, Amazon River).
1824. *Oxyrhynchus nasutus.*—Spix, 1824, p. 50, pl. 14, fig. 3.
1824. *Oxyrhynchus acutirostris* Spix, p. 52, pl. 21, fig. 3 (type locality, Amazon River).
1824. *Oxyrhynchus proboscideus* Spix, p. 52, pl. 21, fig. 4 (type locality, Rio Solomoẽs, Brazil).—Espada, 1875, p. 178.
1824. *Oxyrhynchus spixii* Wied 1824a, pl. [61], fig. 3 (type locality, Brazil).
1838. *Osilophus typhonius.*—Tschudi, 1838, p. 89.
1843. *Otolophus margaritifer.*—Fitzinger, 1843, p. 32.
1843. *Eurhina proboscideus.*—Fitzinger, 1843, p. 32.
1845. *Trachycara fusca* Tschudi, p. 78, pl. 11, fig. 5 (type locality, region of Ceja between Jauja and Uchubamba, Peru).—Peters, 1873e, p. 624.
1858. *Otilophus margaritifer.*—O. Schmidt, 1858, p. 251, pl. 2, figs. 15, 16.—Günther, 1858, p. 69; 1859a, p. 80.—Cope, 1862b, p. 357.
1858. *Bufo pleuropterus* O. Schmidt, p. 252, pl. 2, figs. 17–19 (type locality, Bolivia to Peru).—Günther, 1858, p. 142.
1870. *Bufo margaritiferus.*—Cope, 1870, p. 156.
1871. *Otilophus typhonius.*—Peters, 1871, p. 403.—Miranda-Riberiro, 1926, p. 135, pl. 20, figs. 1–1b; 1929, p. 67.—Carvalho, 1939a, p. 280.
1875. *Oxyrhynchus typhonius.*—Espada, 1875, p. 171.
1875. *Oxyrhynchus iscrni* Espada, p. 185 (type locality, northeast of Tarma, Peru).
1896. *Bufo thyponius.*—Peracca, 1896, p. 12; 1914, p. 108.

1933. *Bufo typhonius typhonius.*—Leavitt, 1933, p. 8.—Rivero, 1961, p. 29
1953. *Bufo* (*Otilophus*) *typhonius.*—Cei, 1953, p. 511.

Description—An adult male, USNM 146824, from Puerto Nariño, Amazonas, Colombia. Bony ridges on top of head greatly enlarged beginning with supraorbital crest and extending continuously as postorbital crests behind the eye and above the ear, reaching their greatest height just before merging with the large parotoid, and ending above and behind the axilla; posterior part of parotoid not involved in the enlarged crest; but merging with a longitudinal line of conical glands which are continued along the side to the groin, becoming much larger posteriorly; a weak parietal ridge bifurcating from the posterior part of the supraorbital crest. Tongue nearly one-half as wide as mouth opening, elongate oval, its posterior border free and unnotched; snout pointed when viewed from above, truncate in profile, the upper jaw extending well beyond the lower; a knob-like protuberance on angle of jaw. Nostrils opening upwards, slightly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis sharply ridged; loreal region flat, descending nearly vertically to the upper lip. Eye large, prominent, its diameter nearly as great as its distance from tip of snout; interorbital diameter more than twice that of upper eyelid, much greater than interval between nostrils. Tympanum distinct, its greatest diameter three-fifths that of eye, separated from eye by an interval equal to one-half its own diameter, its upper rim involved in the greatly enlarged crest. Fingers long and slender, with lateral ridges and weak basal webs, first finger a little longer than second, fourth longer than either, reaching nearly to base of penultimate phalanx of third; all the digits with bulbous, swollen tips; a distinct oval thumb pad present; a larger oval palmar callus; metacarpal tubercles well developed. Toes moderate, nearly one-half webbed and with lateral ridges, third and fifth subequal, both reaching nearly to base of antepenultimate phalanx of fourth toe; a flattened oval inner metatarsal tubercle and a smaller rounded outer one; no inner tarsal ridge, but a weak outer one to heel; a slight skinfold on heel and knee; soles spinose. Body stout, in postaxillary region equal to width of head without the knob-like protuberances on jaw. When hind leg is adpressed, heel reaches center of tympanum; when limbs are laid along the sides, knee and elbow are slightly separated; when hind legs are bent at right angles to body, heels are widely separated. Skin of upper parts covered with fine and coarse granules; a mid-dorsal series of seven large button-like prolongations of the lumbar vertebrae (in old males only); venter finely granular on chin, more coarsely granular on chest, belly, and lower limb surfaces; no skinfold across the chest; no ventral disk; an internal vocal sac in the male.

Dimensions.—Head and body, 68 mm.; head length, 22.5 mm.; head width, 26 mm.; femur, 26 mm.; tibia, 26 mm.; foot, 20.5 mm.; hand, 16 mm.

Color in alcohol.—Dorsum vandyke to seal brown, except for a few indistinct clove brown spots on back and slightly darker edges on the crests; side of body drab below, merging gradually with the darker brown of the upper surfaces; side of head light drab, immaculate; posterior surface of femur hair brown, the tubercles lighter; venter light drab-gray with some large irregular drab spots on the belly, and very pale suffusions of light drab on chest and throat; soles of feet vandyke brown, the webs and disks a little lighter; palms of hands light drab, the tubercles and disks fawn color.

Remarks.—The smaller toads from Puerto Nariño, Amazonas, are more brightly marked, USNM 146827 (46.5 mm. in length) having a wide pale middorsal stripe and showing two wide dark crossbands across femur, tibia, foot, and forearm. The lower surface of the tarsus and outer part of the metatarsal region are vandyke brown, while the inner part is a contrasting pale olive-buff. One of the old males (USNM 146823) has two black lunar markings between the eyes and three other pairs of such markings on each side of the midline of the back. The belly may be heavily brown-spotted, as in USNM 146830, or nearly uniform olive-buff, as in USNM 146828, only slightly so in three of the others, and quite distinctly so in the remaining three specimens of the series. The knob at the angle of the jaw is produced to varying degrees in all, while the "buttons" along the backbone are evident in four of the specimens in the series. In fact, the knob is very distinct in more than three-fourths of the toads at hand from various regions in Colombia. For instance, the knob is well developed in 26 of 30 examples from Amazonas and 14 of 16 examples from Meta.

The toes are one-third to one-half webbed in all Colombian toads examined.

The males at breeding time have the area on the inside of the first finger roughened; they can be distinguished, externally, from the females even in a melanistic population.

One of the most peculiar characteristics of this toad, aside from the hyperdevelopment of the head crests, is the appearance of a row of five to seven "buttons" on the midline of the back coinciding with the upper central part of the seven vertebrae. This characteristic occurs in its most extreme form in old males with large head crests. An example from the Maroni River, British Guiana (USNM 108987, figured by Cochran, 1961a, p. 42), has five large and two small "buttons" and otherwise is similar to the one from Colombia described above. The protrusion of ribs through the skin is known in a few amphibians, such as the Spanish newt, *Pleurodeles waltl.* As some toads have distinctly "knobby" vertebrae—*Bufo alvarius* and *B. valliceps*, to name only two—it is perhaps not surprising that an overgrowth on the back also should take place in a species where abnormal growth is already evident in the postorbital crests.

Since this species, over its extremely wide range, is extremely variable in the bony development of its head crests and vertebral knobs, it is another of the forms requiring comparison of many specimens from Central and South America before a discussion of some proposed subspecies becomes practicable. For this reason the status of *Bufo alatus* Thominot, 1884, *B. chanchanensis* Fowler, 1913, and *B. roqueanus* Melin, 1941, is not considered here.

Specimens Examined

COLOMBIA

AMAZONAS: Gino-Gojé, lower Río Apaporis, USNM 144621–5; Leticia, UF 10017; Puerto Nariño, USNM 146823–30; Río Apaporis, USNM 144626–33; 144931–2 (juv.) 150154–6; Sorotama, upper Río Apaporis, USNM 144634–6.

ANTIOQUIA: Medellín, CNHM 63843–4; Puri, CNHM 63842; Urabá, Villa Arteaga CNHM 63841.

BOLÍVAR: Ciénaga de la Raya, USNM 145776; Murucucú, Sinú River side, 500 m., CNHM 61695; probably upper Río Sinú, CNHM 61680; Regeneración, USNM 127856–62.

CAQUETÁ: Aserrío, MLS 51, 248; Río Orteguaza, Villa María, USNM 146812–3 (juv.).

CAUCA: Near Moscopán, USNM 14624–31; Gorgona Island, USNM 145107–23.

CHOCÓ: Andagoya, USNM 144638–42, 150157–63; Caño Sando, tributary of Río Pepé, lower Río Baudó, USNM 144643–4; "Darién," USNM 4337–8(?); Río San Juan, 10–15 mi. west of Playa de Oro, USNM 147142–7, 150623–5, tributary of Río Opogodó, near Quebrada Santa Anna, USNM 124266; upper Río Pepé, tributary of Río Baudó, USNM 144645–6.

CÓRDOBA: Alto de Quimarí, CNHM 61757–63, 61766.

CUNDINAMARCA: Beltrán, between Girardot and Puerto Boyacá, upper Río Magdalena, 350 m., USNM 147253; Fusagasugá, USNM 144650, 146200; La Mesa, USNM 144651–2; San Francisco, USNM 144647–9.

META: Buenavista, USNM 144661–3; Guaicaramo, USNM 146821–2 (female with eggs); La Macarena, Camp "Las Ranas," USNM 144657, Las Mesetas, Camp "Las Ranas," USNM 144658; Macarena, Camp No. 1, USNM 144656; mouth of Caño Losada, USNM 144653–5; Río Renjifo, 1,500 m., CNHM 81343–8; Serranía de La Macarena, Río Guapaya, 330 m., CNHM 81339–42; upper Río Güejar, Camp "La Macarena," USNM 144659–60; Villavicencio, USNM 144664–6.

NARIÑO: Imbilí Río Mira, USNM 147399–400; La Guayacana, 250 m., CNHM 61691–4, 61777; Río Mataja, USNM 147276–316.

PUTUMAYO: San Antonio, above Puerto Asís on the upper Guamués, tributary of the upper Putumayo, USNM 144667; Umbría, 400 m., CNHM 61696–8, 61721–30; Urcusique, USNM 144673.

SANTANDER: Lebríja, Girón, USNM 144673; Quebrada La Lechera, Vélez, USNM 144668–72; San Gil, CM 7935–6, 7965.

TOLIMA: Mariquita, USNM 144674–7.

VALLE: El Pailon, 12 km. from Buenaventura, USNM 145080; lower Calima River, USNM 145082; Camp Carton de Colombia, USNM 149713–21; Virology Field Station, Río Raposo, USNM 147517–8, 151332–77; Río Anchicayá, USNM 144678.

BOLIVIA: Guajaramerin, Beni, USNM 123963; Cercado, Santa Cruz, 7.6 km. east of Cocota, 1,233 ft., USNM 142107–9.

PERU: Domo Santa Clara, Orellana, USNM 127934–6; Campo Santa Clara, USNM 127144–5; Quebrados Baños, near Campo Santa Clara, USNM 127146. Pucallpa, JP 255, 1 mi. above San Miguel, USNM 107648.

Bufo marinus (Linnaeus)

PLATE 13F–H

1758. *Rana marina* Linnaeus, p. 211 (type locality, America).—Laurenti, 1768, p. 31.

1768. *Bufo brasiliensis* Laurenti, p. 26 (type locality not given).—Shaw, 1802, p. 160, pl. 46.

1799. *Bufo marinus.*—Schneider, 1799, p. 219.—Merrem, 1820, p. 182.—Girard, 1858, p. 80, pl. 5, figs. 1–3, pl. 6, figs. 1–3.—Steindachner, 1867, p. 45; 1901, p. 23.—Peters, 1873a, p. 226.—Jimínez de la Espada, 1875, p. 195.—Boulenger, 1882a, p. 315.—Berg, 1896, p. 190.—Baumann, 1912, p. 96.—Barbour and Noble, 1921, p. 609.—Nieden, 1923, p. 138.—Lutz and Lutz, 1939, p. 250.—Freiberg, 1941, p. 114.—Dunn, 1944c, p. 513.—Breder, 1946, p. 394.—Aleman, 1952, p. 27; 1953, p. 224.—Johnson, 1952, p. 284.—Mertens, 1952a, p. 26.—Cei, 1953, p. 511; 1956, p. 38.—Gallardo, 1962, p. 96.—Goin and Layne, 1958, p. 102.—Vanzolini, 1959, p. 168.—Ginés, 1959, p. 118—Gorham, 1963, p. 15.

1802. *Bufo agua* Daudin, p. 99, pl. 37 (type locality, "l'Amerique meridionale principalement Brésil"); 1803, p. 209.—Spix, 1824, p. 44, pl. 15.—Wied, 1824a, pl. [37].—Duméril and Bibron, 1841, p. 703.—Günther, 1858, p. 65.

1802. *Bufo horridus* Daudin, p. 97, pl. 36 (type locality unknown); 1803, p. 201.

1803. *Bufo humeralis* Daudin, p. 205 (type locality, Cayenne).

1820. *Bombinator horridus.*—Merrem, 1820, p. 179.

1824. *Bufo maculiventris* Spix, p. 43, pl. 14, fig. 1 (type locality, Solimoens, Brazil).

1824. *Bufo lazarus* Spix, p. 45, pl. 17, fig. 1 (type locality, Amazonfluss).

1843. *Docidophryne agua.*—Fitzinger, 1843, p. 32.

1845. *Bufo molitor* Tschudi, p. 73, pl. 12 (type locality, Peru).

1860. *Docidophryne lazarus.*—Fitzinger, 1860, p. 415.

1862. *Phrynoidis agua.*—Cope, 1862b, p. 358.

1899. *Bufo pithecodactylus* Werner, p. 481 (type locality, La Unión, [Cundinamarca,] Colombia.

1901. *Bufo marinus agua.*—Gadow, 1901, p. 178.

1920. *Bufo marinis.*—Barbour and Noble, 1920, p. 425.—Barbour, 1930, p. 75.—Crawford, 1931, p. 29.

1948. *Bufo marinus marinus.*—Vellard, 1948, p. 148.—Rivero, 1961, p. 25.

1961. *Bufo pythecodactylus.*—Rivero, 1961, p. 27.

Description.—USNM 144619, an adult male from Mitú, Vaupés, Colombia. Heavy bony ridges on top of head. Parotoids very large, triangular, twice the diameter of eye. Tongue about half as wide as mouth opening, broadly ovate, its posterior border free and unnotched; snout nearly truncate at tip when viewed from above, truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, strongly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis strong; loreal region concave, nearly vertical and in a line with the upper lip. Eye large, prominent, its diameter 1⅓ times its distance from tip of snout; interorbital diameter 1¾ times that of upper eyelid, much greater than interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers fairly long, with lateral ridges, free, first finger longer than second and equal to fourth, both reaching beyond base of penultimate phalanx of third; a flat oval thumb pad present; a large rounded palmar callus; metacarpal tubercles well developed, the distal ones of the third and fourth fingers double. Toes moderately long and one-third webbed, third toe longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; a small semilunar metatarsal tubercle and a smaller flat, round outer one; a very heavy tarsal ridge, ending near heel; a heavy skinfold on heel and knee; soles granular. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches nearly to shoulder; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels barely touch. Skin of upper parts granular, with large spinose warts on each side of midline and toward the sides; bony areas between eyes and near crests nearly smooth; venter finely granular, with transverse folds on throat, abdomen, and lower femur; a row of large tubercles along the sides behind parotoid; a heavy glandular ridge from posterior corner of eye above tympanum, ending at parotoid; no skinfold across the chest; no ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 97.5 mm.; head length, 28 mm.; head width, 36 mm.; femur, 37 mm.; tibia, 38 mm.; foot, 36.5 mm.; hand, 25.5 mm.

Color in alcohol.—Dorsum vandyke brown, some of the tubercles partly encircled by clove brown; a clove brown mark between the eyes; upper limb surfaces seal brown, with indistinct darker marblings; side of head sepia, upper lip wood brown, the crest along upper lip in front of eye with seal brown dots; side of body vandyke brown fading to clay color below, with many dark sepia spots; venter clay color, with heavy sepia reticulations which become small and scattered on lower proximal femur; throat of male with black suffusions; posterior femur seal brown fading below to clay color, with dark vermiculations; soles of feet and palms of hands sepia, the tubercles and toe tips darker. Females have lighter backs with a row of dark spots on either side of the middorsal region.

Remarks.—This extremely hardy and adaptable species is found over the whole of Colombia except in snow-covered regions, and usually it is the most numerous species of the genus wherever it occurs. The huge triangular parotoids make it readily recognizable, and its large size and enormous fecundity cause adults and young to be well known and frequently collected throughout its range.

Attempts to describe and validate local subspecies in South America have been made, so far without much success. The identity of young individuals, with their much less developed parotoids and with the spotted coloration of the female, often has confused herpetologists. A detailed study of *Bufo marinus* from all the areas in which it occurs is needed before the possible subspecific status of the toads from certain localities can be verified.

Colombian Specimens Examined

AMAZONAS: Leticia, USNM 142206–8, 146391–2, 148124–32; Río Apaporis, USNM 144585–6.

ANTIOQUIA: Medellín, USNM 126860–3; near Turbo, Golfo de Urabá, USNM 144587–601.

ATLÁNTICO: Sabanilla, USNM 13870.

BOLÍVAR: Sincelejo, USNM 144602–3.

CHOCÓ: Truando, USNM 12241 (juv.).

CUNDINAMARCA: Beltrán, upper Río Magdalena, USNM 147250–1; Quetame, USNM 144604.

MAGDALENA: Ciénaga, USNM 144154.

META: Villavicencio, USNM 144612, 146818; 7 km. northeast of Villavicencio, USNM 146390–1, 148121–3; Camp La Macarena, upper Río Güejar, USNM 144609–11; near mouth of Caño Losada, upper Guayabero, USNM 144605–8.

NARIÑO: Río Satinga, USNM 147481.

NORTE DE SANTANDER: Catatumbo, 15–20 km. north of Camp Tibu, USNM 145078–9.

SANTANDER: El Centro, USNM 144613; Girón, USNM 148133; Lebríja, territory of La Girona, USNM 144614–6.

TOLIMA: Melgar, USNM 148134.

VALLE: Buenaventura, USNM 124174, 144617; 2 km. south of Cali, USNM 148793; Río Calima near Córdoba, USNM 145772; Guadalajara River near Buga, SU 20305–8.

VAUPÉS: Mitú, USNM 144618–20.

Bufo blombergi Myers and Funkhouser

PLATE 17A–C

1951. *Bufo blombergi* Myers and Funkhouser, p. 279 (type locality, Nachao, Nariño, Colombia).—Cei, 1953, p. 511.—Copping, 1957, p. 56.—Cochran, 1961a, color photograph.—Gallardo, 1962, p. 96.

Description.—USNM 142101, an adult from 50 miles north of Cali, Valle, Colombia, Heavy bony ridges on top of head. Parotoid gland thick and prominent, oval, its length equal to distance from tip of snout to posterior border of eye; tongue half as wide as mouth opening, oval, its posterior border free and unnotched; snout broadly rounded when viewed from above, truncate in profile, the upper jaw scarcely extending beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostrails blunt but distinct; loreal region concave, vertical, merging gradually with the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter a little over twice that of upper eyelid, much greater interval between nostrils. Tympanum not very distinct, its greatest diameter a little over one-half that of eye, separated from eye by an interval equal to its own diameter. Fingers moderate in length, with very faint, blunt lateral ridges, free, first finger much longer than second, fourth longer than either; a large blunt thumb pad present; a poorly defined round palmer callus; metacarpal tubercles well developed. Toes long, one-half webbed, third toe much longer than fifth, its tip reaching to middle of antepenultimate phalanx of fourth; a heavy, blunt, oval metatarsal tubercle and a rounded outer one; a distinct tarsal ridge, ending near heel; a distinct skinfold on heel and knee. Body very stout, in postaxillary region wider than greatest width of head. When hind leg is adpressed, heel fails to reach the shoulder; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are slightly separated. Skin of upper parts coarsely glandular, with many small tubercles on posterior part of back and sides; a heavy glandular fold along side from parotoid to groin; venter granular, the granules on belly nearly flat, those on throat and chest smaller, a little more raised; a heavy bony ridge from posterior corner of eye above tympanum, ending at anterior end of parotoid; a pair of wide, blunt scapular ridges; another wide bony ridge from inner posterior corner of eye to nuchal region; a faint skinfold across the chest; no ventral disk; an external vocal sac in male.

Dimensions.—Head and body, 212 mm.; head length, 60 mm.; head width, 80.5 mm.; femur, 79 mm.; tibia, 80 mm.; foot, 68 mm.; hand, 53.5 mm.

Color in alcohol.—Dorsum drab with very indefinite sepia mottlings; posterior belly wood brown, the granules sepia; throat, sides of chest and anterior belly olive, with an occasional small olive buff spot; upper limb surfaces olive, with faint darker reticulations and with the large blunt tubercles tipped with clove brown; sides of body dirty olive buff with darker tubercles; sides of head dull olive with very indistinct darker markings; soles of feet and palms of hands wood brown; the tips of toes and fingers darker; webs between toes also wood brown.

Remarks.—Another specimen at hand, USNM 142102, a female with the same data as the described specimen, has the following millimeter measurements: head and body, 172; head length, 50; head width, 63.5; femur, 65; tibia, 66; foot, 60; hand, 43. The critical proportions are very close to those of the described specimen. The only important differences are that the tympanum is much more distinct in the smaller specimen but is only two-fifths the diameter of the eye and the toes are about one-fourth webbed.

Specimens Examined

COLOMBIA

VALLE: 50 mi. north of Cali, USNM 142101–2; near Anchicayá, USNM 145775; Río Calima, USNM 145774.

Bufo coniferus **Cope**

PLATE 16A–C

1862. *Bufo coniferus* Cope, 1862a, p. 158 (type locality, Turbo region, New Granada [-Chocó], Colombia).—Boulenger, 1882a, p. 321; 1898a, p. 123; 1914, p. 813.—Günther, 1901, p. 251, pl. 69, fig. B.—Nieden, 1923, p. 133.—Kellogg, 1932, p. 29.—Breder, 1946, p. 394.—Gallardo, 1962, p. 96.

1862. *Chilophryne conifera.*—Cope, 1862b, p. 358; 1865b, p. 102.—Kellogg, 1932, p. 29.

1863. *Lucilius coniferus.*—Cope, 1863, p. 50; 1865b, p. 102.—Kellogg, 1932, p. 29.

1899. *Bufo ehlersi* Werner, p. 481 (type locality, El Bargell, near Guaduas, Colombia).—Nieden, 1923, p. 133.

Description.—USNM 4335 (holotype), an adult from Turbo, Chocó, Colombia. Supraorbital, postorbital, and parietal bony ridges on top of head, the two first continuous in an obtuse angle. Tongue about two-fifths as wide as mouth opening, spatulate, its posterior border free and unnotched; snout widened at tip, with a small vertical ridge when viewed from above, nearly truncate in profile, the upper jaw extending well beyond the lower. Nostrils superolateral, strongly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis very strongly ridged, concave in outline; loreal region vertical, slightly concave, sloping a little to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter twice that of upper eyelid and of interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers quite long, slightly webbed and with lateral ridges, first finger shorter than second, fourth longer than either, its tip reaching to base of penultimate phalanx of third; a small triangular thumb pad present; a large squarish palmar callus; metacarpal tubercles well developed, single. Toes moderately long, one-half webbed, third toe slightly longer than fifth, its tip reaching halfway along antepenultimate phalanx of fourth; a small, oval inner metatarsal tubercle and a smaller round outer one; no tarsal ridge; a heavy skinfold on heel and knee. Body stout, in postaxillary region slightly less than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye and tarsometatarsal articulation well beyond snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts granular, with scattered warts from back of head to above anus; parotoids small but with several large warts; a row of spiny warts from posterior end of parotoids along sides to groin; venter granular with small warts on side of belly and below thighs; a short bony ridge from posterior corner of eye above tympanum, ending at parotoid; the head between supraorbital ridges flat and nearly smooth; a slight skinfold across the chest; no ventral disk; a median external vocal sac in male.

Dimensions.—Head and body, 75 mm.; head length, 22.5 mm.; head width, 27.5 mm.; femur, 30.5 mm.; tibia, 32.5 mm.; foot, 31.5 mm.; hand 26.5 mm.

Color in alcohol.—Dorsum cinnamon with suggestions of large, irregular, chocolate spots on either side of the paler midline; a pair of crescentic pale cinnamon spots on shoulders just behind parotoids and another pair on sacrum; limbs with wide, inconspicuous dark bands above; venter uniform russet, becoming paler on belly; side of head chocolate with a pale cinnamon diagonal bar from lower eyelid to corner of mouth, with darker markings in front of and behind it; sides of body chocolate lightening to cinnamon below; palms of hands and soles of feet wood brown, the digital tips and tubercles a little lighter.

Remarks.—The largest of 16 examples at hand, BM 98.4.28.142 from Cachabé, Ecuador, measures 90 millimeters in head and body length. The first finger is appreciably shorter than the second in all, while the toes are one-half webbed. The prominent nostrils and small projecting vertical ridge on the snout may suggest a slight relationship with *Bufo granulosus*.

Specimens Examined

COLOMBIA

Chocó: Peña Lisa, Condoto, BM 1914.5.21.89; Turbo, USNM 4335 (type).

ECUADOR: Cachabé, BM 98.4.28.141–5; Cayapas River, BM 1902.7.29.33–4; Pambelas, BM 1901.6.27.17–9; San Javier, BM 1901.3.29.58.

PANAMA: Porto Bello, USNM 65124; upper Trinidad River, USNM 53719.

Bufo sternosignatus Günther

PLATE 13D–E

1858. *Bufo sternosignatus* Günther (part*), p. 68, pl. 5, fig. c (type locality, Puerto Cabello, Venezuela); 1901, p. 247.—Keferstein, 1867, p. 352; 1868, p. 294.—Boulenger, 1882a, p. 323.—F. Müller, 1884, p. 279.—Peracca, 1914, p. 108.—Werner, 1916, p. 302.—Beebe, 1919, p. 207.—Nieden, 1923, p. 132.—A. Lutz, 1927, pp. 38, 42, pl. 8, figs. 3, 4.—Kellogg, 1932, pp. 13, 68, 70.—Mello-Leitão, 1937, p. 278.—Smith and Taylor, 1948, p. 45.—Ginés, 1959, p. 118.—Rivero, 1961, p. 28; 1964b, p. 311.—Gallardo, 1962, p. 96.

1947. *Bufo typhonius sternosignatus.*—Shreve, 1947a, p. 535.

Description.—BM 68.9.15.1, a young male from Bogotá, Cundinamarca, Colombia. High sharp, bony ridges on top of head. Parotoids small. Tongue half as wide as mouth opening, oval, its posterior border free and unnotched; snout with a narrow, vertical ridge down the front, but truncate at tip when viewed from above, slightly rounded in profile, the upper jaw extending considerably beyond the lower. Nostrils dorsolateral, distinctly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis bordered by a sharp, curving ridge; loreal region concave, vertical, merging with the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter twice that of upper eyelid and twice interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by a very minute interval. Fingers moderately long, with lateral ridges, free, first finger a little shorter than second, fourth longer than either, its tip reaching to base of penultimate phalanx of third; a small but prominent oval thumb pad present; a large, round palmar callus; metacarpal tubercles well developed. Toes fairly long, one-half webbed, third and fifth toes subequal, reaching to base of penultimate phalanx of fourth toe; a small but prominent oval metatarsal tubercle and a smaller round outer one; no tarsal ridge; a distinct skinfold on heel and knee; soles granular. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts covered with small tubercles, with a few larger ones intermingled with them; a line of pointed, conical tubercles from end of postorbital crest over middle of parotoid and along the side diagonally downwards to groin; a similar line of pointed tubercles along outside of foot from heel to end of fifth toe; venter finely granular, with a few larger granules in front of anus; a bony postorbital ridge from posterior corner of eye to tympanum, somewhat elevated above head surfaces; a short, rather indistinct

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*Two cotypes from Córdoba, Mexico, are now considered to be *Bufo valliceps* Wiegmann.

parietal ridge; a distinct skinfold across the chest; a weak ventral disk; an external median vocal sac in the male.

Dimensions.—Head and body, 40 mm.; head length, 14 mm.; head width, 14.5 mm.; femur, 15 mm.; tibia, 16.5 mm.; foot 13.5 mm.; hand, 11 mm.

Color in alcohol.—Dorsum raw sienna; a pale middorsal line from snout to anus; a dark chevron-shaped mark on upper eyelids and interocular region, and other indistinct dark diagonal markings on the back; upper limb surfaces ochraceous with a few wide sepia crossbars, venter buff, with small sepia spots on throat and anterior half of abdomen and a larger triangular sepia mark on center of chest; side of head ochraceous-buff, with three or four sepia spots on upper lip, the largest one below anterior corner of eye; a large sepia patch from corner of mouth to postocular ridge, covering tympanum, and extending backwards below the line of pointed tubercles on parotoid and along the side through groin and along anterior femur; inner half of sole of foot buff, the outer half pale sepia; palms of hands buff.

Remarks.—This species resembles *Bufo coniferus* and *B. typhonius* in having a short vertical ridge along the tip of the snout; in fact, Shreve (1947a, p. 535) assigned *sternosignatus* a subspecific rank under *typhonius*. All three likewise have a raised postorbital crest, which, in *coniferus* at least, apparently does not increase in older and larger animals to the fantastic proportions found in *typhonius* of similar size. But in *coniferus* the parietal crest reaches a much greater development than it does in the other two, making nearly a right angle with the subocular crests while the tubercles on the back, and especially those behind the ear and along the side, are much higher and more "spiky."

Both *typhonius* and *sternosignatus* have a curving crest around the eye merging gradually with the parietal crest, without forming a right angle. In *typhonius*, the angle of the jaws is produced beyond the usual head outline, while in *sternosignatus* the jaws are normal.

Rivero (1961, p. 39) discredits the presence of *B. sternosignatus* in Colombia as follows:

> Reported from Colombia by Peracca, 1914 (Cafetal Camelia, nr. Angelopolis, 1820 M.), Werner, 1916 (Cañon de Tolima), and Boulenger, 1882 (Bogotá). These records probably refer to *B. typhonius alatus.* Dunn (1944) does not mention this species in his "Herpetology of the Bogotá area," but he includes *Bufo typhonius* in the actual fauna of Bogotá . . . .

On the strength of Boulenger's identification of the Bogotá frog, this spciee is retained in the Colombian fauna.

Specimens Examined

COLOMBIA
Cundinamarca: Bogotá, BM 68.9.15.1–2
VENEZUELA: Andes of Venezuela, BM 94.8.31.12.

Bufo glaberimus Günther

PLATE 16D–F

1869. *Bufo glaberrimus* Günther, p. 483, pl. 37, fig. 2 (type locality, Bogotá, Cundinamarca, Colombia.—Boulenger, 1882a, p. 291; 1898a, p. 123.—Peracca, 1904, p. 35.—Nieden, 1923, p. 112.—Gallardo, 1962, p. 96.

Description.—USNM 144566, a half-grown specimen from Caño Grande, Villavicencio, Meta, Colombia. No bony ridges on top of head. Parotoids large, 1½ times the eye diameter, oval, nearly longitudinal, with a heavy lateral skinfold from the posterior outer border along sides almost to groin; tongue half as wide as mouth opening, obovate, its posterior border free and unnotched; snout rounded when viewed from above, truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis distinct; loreal region flat, nearly vertical, slightly concave before merging with the upper lip. Eye large, prominent, its diameter 1⅓ times its distance from tip of snout; interorbital diameter three-fourths that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-fifths that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers moderately long, with lateral ridges, free, first finger a little longer than second, fourth longer than either, reaching halfway on penultimate phalanx of third; a small round thumb pad present; a large, rounded palmar callus; metacarpal tubercles well developed. Toes moderately long, one-half webbed, third toe much longer than fifth, its disk reaching halfway on antepenultimate phalanx of fourth; subarticular tubercles distinct, all single; a small but prominant oval inner metatarsal tubercle and a smaller round outer one; a blunt tarsal ridge, ending near heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches to shoulder and tarsometatarsal joint reaches to end of snout; when limbs are laid along the sides, knee and elbow are narrowly separated; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts nearly smooth (glandular under lens), with a few minute pustules between the eyes and some faint tubercles on sacrum; belly faintly granular, throat and chest nearly smooth; lower leg surfaces more heavily granular; a short, heavy glandular ridge from posterior corner of eye above tympanum, ending at parotoid; a faint skinfold across the chest; a distinct ventral disk; an external vocal sac in the male?

Dimensions.—Head and body, 37 mm.; head length, 12 mm.; head width, 13 mm.; femur, 14.5 mm.; tibia, 16 mm.; foot, 14.5 mm.; hand, 10.5 mm.

Color in alcohol.—Dorsum immaculate smoke-gray parotoids wood brown, upper leg surfaces with indistinct traces of two or three dark-edged crossbars; throat and chest cream buff, becoming drab gray on belly; lower leg surfaces coarsely mottled with cream buff and drab gray; a wide seal brown lateral stripe beginning behind tympanum on outer third of parotoid, continuing below lateral skinfold and fading out midway to groin; anterior femur heavily marked with long sepia bands on a buff ground; groin buff with a vertical sepia spot in front of it; posterior femur and tibia with smaller sepia reticulations on a buff ground; arm olive-buff with a few pale sepia reticulations beneath and a darker reticulation on elbow; side of head olive-gray with a few traces of sepia spots below eye and along lip border; soles of feet slate-gray to dull olive-buff, the toe tips and subarticular tubercles buff, palms of hands similar but lighter.

Remarks.—This toad seems less brightly colored than other specimens of nearly the same size or smaller. Some are almost white (in alcohol) with black markings, the largest of which are concentrated along each side of the midline; smaller black markings thickly cover the outer parts of the back. In specimens over 50 millimeter long, the back is usually uniform light brown or gray. The ventral region is pale or faintly spotted in young specimens, but it often becomes clove brown with scattered pale dots in the large, old individuals. The toes are one-third to one-half webbed; the first finger is usually longer than the second, although in a few examples these two fingers are subequal.

Specimens Examined

COLOMBIA
  BOLÍVAR: Alto de Quimarí, CNHM 61767–9.
  CUNDINAMARCA: Bogotá, BM 80.12.5.178.
  META: Caño Grande, Villavicencio USNM 144566–8; Macarena, upper Río Güejar and El Mico, USNM 144556–64; Villavicencio, MLS 63(a–d).
  VALLE: Buenaventura, BM 95.11.16.62–3.
  VAUPÉS: Amanavén, boca del Río Güaviare, USNM 144569–70.
ECUADOR: Cachabé, BM 98.4.28.123–8, USNM 71121; Paramba, BM 88.4.28.129–31; Sarayacu, BM 80.12.5.228.

***Bufo haematiticus* Cope**

PLATE 16G–I

1862. *Bufo haematiticus* Cope, 1862a, p. 157 (type locality, region of Truando, New Granada [Chocó], Colombia); 1876, p. 94.—Keferstein, 1867, p. 353; 1868, p. 295, pl. 9, fig. 3.—Boulenger, 1882a, p. 290; 1898a, p. 123; 1913, p. 1022.—Günther, 1901, p. 243.—Peracca 1904, p. 35.—Nieden, 1923, p. 110.—Andersson, 1939, p. 15.—Breder, 1946, p. 393.—Gallardo, 1962, p. 96.

1862. *Rhaebo haematiticus.*—Cope, 1862b, p. 357; 1863, p. 49.

Description.—USNM 147516, an adult female from the Virology Field Station, Río Raposo, Valle, Colombia. No bony ridges on top of head. Tongue about two-fifths as wide as mouth opening, spatulate, its posterior border free and unnotched; snout broadly rounded when viewed from above, declivitous in profile, the upper jaw extending well beyond the lower. Nostrils lateral, projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis sharp and straight; loreal region flat, vertical, descending to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1¼ times that of upper eyelid, almost twice the interval between nostrils, Tympanum distinct, its greatest diameter three-fifths that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers rather long, with very weak lateral ridges, free, first finger much longer than second, fourth longer than either, its tip reaching to base of penultimate phalanx of third; a small oval thumb pad present; a larger squarish palmar callus; metacarpal tubercles well developed, single. Toes fairly long, one-fourth webbed, third toe a little longer than fifth, its tip reaching halfway on antepenultimate phalanx of fourth; a prominent oval inner metatarsal tubercle and a smaller round outer one; a rather indistinct tarsal ridge, ending near heel; a series of skinfolds on heel and knee. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye and tarsometatarsal articulation extends far beyond tip of snout; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts weakly tubercular everywhere, even between eyes and on eyelids; venter smooth, but with fine folds across throat and most of abdomen; a short, narrow glandular ridge from posterior corner of eye above tympanum, merging with the parotoid, which is as long as its distance from nostril; no skinfold across the chest; no ventral disk; an external vocal sac in male.

Dimensions.—Head and body, 46 mm.; head length, 15 mm.; head width, 15.5 mm.; femur, 20 mm.; tibia, 22 mm.; foot, 16.5 mm.; hand, 12 mm.

Color in alcohol.—Dorsum sepia, with a pair of clove brown spots between shoulders and another pair just anterior to sacrum; upper limb surfaces with indistinct darker crossbands; venter seal brown anteriorly, the posterior part of belly and lower surface of limbs fawn color with heavy seal brown spots except on proximal lower femur which is unspotted; posterior femur mottled sepia and fawn color; side of head clove brown, with a paler spot from anterior corner of eye to lip border; side of body sepia, mottled with fawn color below; palms of hands and soles of feet seal brown, the tubercles a little lighter.

Remarks.—Since the cotypes are discolored and in poor condition after more than a century, a fresh example has been chosen for describing and figuring. The maximum known head and body length is 90 millimeters, in BM 1914.5.21.88. The toes are from one-fourth to one-third webbed in all examples at hand, and the tarsometatarsal articulation extends far beyond the tip of the snout.

Colombian Specimens Examined

CHOCÓ: Andagoya, USNM 124233, 144679–80; Juntas, BM 1910.7.11.69–70; Peña Lisa, Condoto, BM 1913.11.12.103–6, 1914.5.21.87–8; Río San Juan, 10–15 km. west of Playa de Oro, USNM 147148–58; Truando, USNM 4344, 48448–9 (cotypes).

NORTE DE SANTANDER: 15–20 km. north of Camp Tibú, Catatumbo, USNM 145077.

SANTANDER: Ríonegro, MLS 249.

VALLE: Buenaventura, BM 95.11.16.57–61; Virology Field Station, Río Raposo, USNM 147515–6.

Bufo hypomelas **Boulenger**

PLATE 17D–F

1913. *Bufo hypomelas* Boulenger p. 1022, pl. 102, fig. 1 (type locality, Condoto, Chocó, Colombia).

Description.—AMNH 14031, an adult from Andes, Antioquia, Colombia. No bony ridges on top of head. Parotoids large, elongate oval, their length equal to distance from tip of snout to center of eye; tongue two-third as wide as mouth opening, ovate, its posterior border free and unnotched; snout broadly rounded when viewed from above, truncate and sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis distinct; loreal region flat, vertical, the upper lip flaring out below it. Eye large, prominent, its diameter 1½ times its distance from tip of snout; interorbital diameter a trifle greater than that of upper eyelid, equal to interval between nostrils. Tympanum indistinct. Fingers long, without lateral ridges, free, first finger shorter than second, fourth longer than either, its tip reaching beyond base of penultimate phalanx of third; a small oval thumb pad present; a large round palmar callus; metacarpal tubercles well developed. Toes rather short, one-half webbed, third and fifth toes subequal, their tips reaching to base of antepenultimate phalanx of fourth toe; subarticular tubercles not strongly developed; a very small, oval, inner metatarsal tubercle and a smaller round outer one; an indistinct tarsal ridge, apparently ending at heel; a heavy skinfold on heel and knee. Body moderately stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts minutely pustular, with some faint tubercles on head and upper eyelids; venter smooth, with a few granules around the vent; a short but heavy postocular crest, followed by the narrow, elongate parotoid gland, about 1½ times the length and one-half the width of the eye; no skinfold across the chest; no ventral disk; an external vocal sac in the male?

Dimensions.—Head and body, 23.5 mm.; head length to angle of jaw, 7.5 mm.; head width, 7.5 mm.; femur, 9.5 mm.; tibia, 10 mm.; foot, 9 mm.; hand, 7.5 mm. (Length of the type specimen was said to be 20 millimeters.)

Color in alcohol.—Dorsum vandyke brown, with several large, rounded, light bordered spots on either side of midline, the first of these extending onto eyelids, the last more chevron-shaped and just behind the sacrum; upper limb surfaces pale russet with wide seal brown crossbars; venter drab with heavy sepia reticulations that are closer together anteriorly; soles of feet and palms of hands drab, with paler metacarpal and metatarsal tubercles; webs between toes pale wood brown; sides of head wood brown, with several larger darker spots along upper lip and in loreal region; sides of body mostly seal brown, with a few small drab spots; traces of a pale longitudinal line along dorsolateral region.

Remarks.—In structure, *Bufo hypomelas* resembles the young of *B. blombergi* except that it lacks the parietal crests of *blombergi* (such crests are not always developed in young specimens) and the first finger is slightly shorter than the second in *hypomelas* but is longer in *blombergi*. Both species obviously are in the "*guttatus*" group, and they represent the midget and the giant of that group. *B. hypomelas* is only 23.5 millimeters long; the type of *blombergi* is 207 millimeters long.

The heel of AMNH 14031 reaches the posterior border of the eye, while that of the type was said to extend to the tip of the snout. The tympanum of the former is indistinct; in the latter it is moderately distinct and equal to one-half the eye diameter. These differences might be bridged if more material were available. The color pattern of AMNH 14031—where it remains—is like that shown in the figured type specimen.

With but a single specimen at our disposal, the range of variation in critical measurements remains unknown. The very distinctive color pattern of *B. hypomelas* makes it one of the easiest toads to identify.

Family ATELOPODIDAE

Girdle firmisternal. No omosternum. Sacral diapophyses dilated. Eggs laid in water. Tadpoles aquatic.

Genus *Atelopus* Duméril and Bibron

1841. *Atelopus* Duméril and Bibron, p. 660 (type species, *A. flavescens* Duméril and Bibron).

Generic diagnosis.—Pupil horizontal. Tongue elliptical, entire, free behind. Palate smooth. No tympanic disk. Fingers free or webbed at base; toes more or less webbed, the tips not dilated into regular disks; one or more digits sometimes lacking. Outer metatarsals united. Coracoids and precoracoids more or less divergent, connected by the epicoracoid cartilage; no omosternum; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated. Terminal phalanges simple.

Key to Colombian Species of *Atelopus*

a^1. Arms and legs massively developed; size to 53 mm . . . . **A. pachydermus**
a^2. Arms and legs not unusually large.
  b^1. Upper jaw not, or scarcely, projecting beyond lower; color mainly black.
    c^1. Fourth toe long, other toes poorly developed and relatively short; tympanum hidden; size 30 mm . . . . **A. bufoniformis**
    c^2. All toes normally developed; tympanum distinct anteriorly; size to 48 mm . . . . **A. ebenoides ebenoides**
  b^2. Upper jaw extending appreciably beyond lower.
    c^1. Eye diameter equal to or slightly greater than snout length.
      d^1. Skin thickened, often rough and tubercular; metacarpal tubercles well developed.
        e^1. Belly slate color with large light paired spots; size to 45.5 mm. **A. ebenoides marinkellei**
        e^2. Belly immaculate cream; size to 50 mm . . . . . . **A. ignescens**
      d^2. Skin thinner, fairly smooth above.
        e^1. Metacarpal tubercles absent or weak; toes one-half webbed.
          f^1. Heel not reaching beyond posterior corner of eye.
            g^1. Heel not reaching beyond front of shoulder or angle of jaw.
              h^1. Belly light, throat and chest with dark longitudinal spots; size to 37.5 mm . . . . **A. varius subornatus**
              h^2. Belly dark with a few large light spots; size to 28.5 mm. **A. pedimarmoratus**
            g^2. Heel reaching to posterior corner of eye; venter pale, immaculate, throat with a dark spot; size to 25 mm . **A. nicefori**
          f^2. Heel reaching between center of eye and nostril.
            g^1. Belly light anteriorly, dark-spotted posteriorly; size to 23.5 mm . . . . **A. spurrelli**
            g^2. Venter immaculate; size to 32.5 mm . . . **A. varius elegans**
        e^2. Metacarpal tubercles well developed.
          f^1. Heel reaching center of eye or beyond; toes nearly completely webbed; size to 38 mm . . . . **A. longibrachius**

f^2. Heel reaching angle of jaw to posterior corner of eye; toes one-half webbed; size to 33 mm . . . . **A. varius bibroni**

c^2. Eye diameter less than snout length.

d^1. Skin thickened, smooth; metacarpal tubercles absent; heel reaching between axilla and posterior border of eye; toes one-half webbed; belly slate gray; chin with a light spot below angle of mouth; size to 51.5 mm . . . . **A. carrikeri**

d^2. Skin thinner, pustular.

e^1. Metacarpal tubercles absent.

f^1. Heel reaching to posterior corner of eye; inner toes entirely, outer ones one-half webbed; belly pale, immaculate; size to 44 mm **A. varius glyphus**

f^2. Heel reaching center of eye; toes one-half webbed; belly pale, immaculate, chin and chest dark; size to 46.5 mm. **A. longirostris**

e^2. Metacarpal tubercles well developed; heel reaching posterior corner of eye; toes one-half webbed; small dark spots on chest, larger ones on belly; size to 39 mm . . . . **A. walkeri**

Atelopus pachydermus (O. Schmidt)

FIGURE 6

1858. *Phirix pachydermus* O. Schmidt, p. 257, pl. 3, fig. 26 (type locality, "westen von Neu-Granada, bei Bonaventura [=Buenaventura, Valle] in einer Höhe von 5000′ ").

1926. *Atelopus cruciger* (not of Lichtenstein and Martins).—Nieden, 1926, p. 84.

1963. *A.[telopus] pachydermus*.—Rivero, 1963c, p. 107.

Nieden has synonymized this species with *Atelopus cruciger*, but Venezuelan examples of *cruciger* have much smaller feet and hands and a dorsal pattern different from that shown in Schmidt's figures.

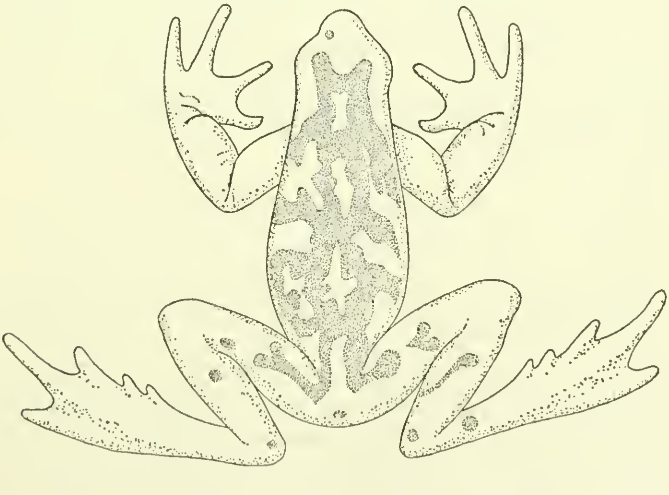

FIGURE 6.—*Atelopus pachydermus* (type of *Phirix pachydermus;* approximately same size). Redrawn by Paul Laessle after O. Schmidt (1858, pl. 3, fig. 26).

Until adequate material has been collected near Buenaventura, the name *pachydermus* is provisionally retained.

The original description (O. Schmidt, 1858, p. 257) is translated as follows:

> [Diagnosis:] A *Phirix* with both anterior and posterior feet very robust; head moderate; snout prominent; skin calloused, thick, color sulphur-yellow on whitish, with blue lines on the back, on the femur, and also on the posterior femur.
>
> As we have already mentioned under generic characters, this animal has a massive build in its flanks and limbs; in fact, the head, although of medium size, shows this thickened characteristic. Its upper central part is horizontal and deepened; the depth of the occiput is bordered by a pair of swollen borders, which appear as the continuation of the equally swollen supraorbital borders. The nostrils are almost as far from the rounded [dome-shaped], prominent snout tip as from the inner eyelid.
>
> The forelimbs are unusually stout, the hands indeed as if stuffed, a rudiment of the thumb [metacarpus] distinct and likewise a distinct although very flat tubercle on the outer ball [palm] besides; first finger thick, short, and rigid, and bending a little towards the second finger. On the tarsus of the hind foot are two weak tubercles. Their web is so thick and, so to speak, leathery, that it gives scarcely the impression of being a web. It is so stiff between the first three toes that these cannot be laid side by side, and indeed the remaining toes do not possess the usual mobility. The sole appears very broad and solid. The first, second, third, and fifth toes are buried in the connecting web, the first and second so that they appear only as a pair of blunt tubercles. The webbing forms a border on the fourth toe from the level of the second articulation.
>
> The skin texture, resembling that of a pachyderm, is thick and marked with weals.
>
> Color: The back shows, on a yellow ground, continuous irregular blue markings which in the center enclose three light spots; a pair of continuations of these blue lines are extended on the thigh. Another blackish blue mark, rather regular and symmetrical, runs transversely over the posterior part of the back and on the underside of the thigh. A distinct mention is merited of the blackish color of the top of the first finger of the forelimb. The entire venter is yellow without interruption.
>
> Size: Body, 53 mm.; forelimb, 40 mm.; hind limb, 75 mm.
>
> Habitat: Western New Granada, near Buenaventura, [Valle,] at an elevation of 5,000 feet. Very rare.

Atelopus bufoniformis **Peracca**

PLATE 18A–C

1904. *Atelopus bufoniformis* Peracca, p. 20 (type locality, Puno, Ecuador)—Nieden, 1926, p. 82.—Rivero, 1963c, p. 107.—Gorham, 1963, p. 24.

Description.—MLS 143, an adult female from Páramo de las Papas, Cauca, Colombia. Head as long as broad. Tongue two-fifths as wide as mouth opening, oval, its posterior border free and unnotched; snout short, broadly angulate when viewed from above, truncate in profile, the upper jaw not extending beyond the lower. Nostrils lateral, not projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis distinct; loreal region concave, vertical, flaring to the upper lip. Eye fairly large and prominent, its diameter equal to its distance from tip of snout; interorbital diameter equal to that of upper eyelid, a little less than interval between nostrils. Tympanum hidden. Fingers short, fully webbed, first finger shorter than second, which is approximately equal to fourth, both reaching to base of penultimate phalanx of third; a small oval thumb pad and a large round palmar callus present; metacarpal tubercles not distinguishable from the coarse granules covering entire palm of hand. First toe distinct; third toe shorter than fifth, which reaches to center of antepenultimate phalanx of fourth, the latter appearing very long in comparison with the others, the web reaching almost to its tip as a wide lateral ridge; a small oval metatarsal tubercle and a small round outer one; sole of foot entirely covered with coarse irregular granules, those on toes appearing to be arranged in pairs; no true tarsal ridge; a heavy skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches barely three-fourths the distance from groin to axilla; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels fail to meet. Skin of upper parts heavily tubercular and warty, the largest warts in a fairly distinct row along the dorsolateral line, with a row of smaller tubercles on each side of the midline; venter and sides with very coarse, large round warts, with somewhat finer granules on limbs and throat; a short glandular ridge from posterior corner of eye straight backwards above tympanic area and ending above arm insertion; no skinfold across the chest; no ventral disk. The male probably has the forearm enlarged but lacks external vocal sacs, as in most other species of the genus.

Dimensions.—Head and body, 30 mm.; head length, 9.5 mm.; head width, 9.5 mm.; femur, 9 mm.; tibia, 9 mm.; foot, 9.5 mm.; hand, 6.5 mm.

Color in alcohol.—Dorsum seal brown anteriorly, clove brown posteriorly, some of the warts a little lighter; venter and sides seal to clove brown, the large round warts walnut brown; sides of head clove brown, immaculate; palms and soles seal brown, the tubercles a trifle paler.

Remarks.—In most characteristics MLS 143 resembles the description of the type of *Atelopus bufoniformis* Peracca from Puno, Ecuador. The snout is equal to the diameter of eye in the former, while it is a little longer than that in the latter. The most noteworthy difference is that the interorbital diameter equals that of the upper eyelid in the former, while it is said to be almost double in the latter. No mention is made in the original description of *bufoniformis* of any reduction in toes 1, 2, 3, and 5, with the resulting prominence of toe 4—characters which are exceedingly obvious in the Cauca frog.

The described specimen was the only one examined.

Atelopus ebenoides ebenoides Rivero

PLATE 18D–F

1963. *Atelopus ebenoides* Rivero, 1963c, p. 3, pl. 3, figs. 6, 9 (type locality, Páramo de las Papas, 3,600 m., San Agustín, Huila, Colombia).

Description.—CNHM 69746 (holotype), an adult female from Páramo de las Papas 3,600 m., San Agustín, Huila, Colombia. Head as long as broad, its length a little more than one-fourth that of head and body; tongue very long and narrow, one-third as wide as mouth opening, its posterior border free and unnotched; snout nearly truncate when viewed from above, truncate in profile, the upper jaw extending only slightly beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis rounded but prominent; loreal region deeply concave, sloping steeply outwards to the upper lip. Eye large, prominent, its diameter nearly as great as its distance from tip of snout; interorbital diameter 1½ times that of upper eye lid; equal to interval between nostrils. Tympanum indistinct posteriorly, its greatest diameter about two-fifths that of eye, separated from eye by an interval equal to three-fourths its own diameter. Fingers moderately long, with thick lateral ridges, webbed at the base, the tips of all digits bulbous, first finger much shorter than second, fourth longer than either and reaching to base of last phalanx of third; a flat oval thumb pad present; a large round palmar callus; metacarpal tubercles weakly developed. Toes rather short, nearly completely webbed, excepting the distal part of fourth toe, third and fifth toes subequal, their disks reaching to center of antepenultimate phalanx of fourth toe; a small oval inner metatarsal tubercle and a smaller round outer one; a very faint tarsal ridge, ending near heel; a heavy skinfold on heel and knee. Body rather stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches front of shoulder; in the adpressed arm, tip of third finger just reaches to end of body; when limbs are laid along the sides, knee and elbow are slightly separated; when hind legs are bent at right angles to body, heels are separated. Skin of upper parts thick, with many low round warts from level of shoulders backwards, extending onto the sides and becoming larger; venter pustular and slightly granular, with small tubercles on throat, chest, and posterior femur; a heavy bony ridge from posterior corner of eye extending straight back and ending in a small knob behind the tympanum; a pair of bony arc-shaped ridges behind the head extending onto anterior part of back; no skinfold across the chest; no ventral disk. External vocal sacs in the male?

Dimensions.—Head and body, 48 mm.; head length, 13 mm.; head width, 13 mm.; femur, 17 mm.; tibia, 16.5 mm.; foot, 17.5 mm.; hand, 12 mm.

Color in alcohol.—Dorsum slate-black, with a dorsolateral series of round buff spots covering some of the large tubercles; venter slate-black, with a pair of large irregular buff spots on either side of the chin, with paired buff spots below arm and on side of belly, and with some median buff spots on posterior part of belly; side of head slate-black, a small buff crescent below eye and a light dot below nostril; limbs slate-black with small buff spots behind and below femur, on outside of tibia, and on upper and lower surfaces of tarsus; soles of feet and palms of hands dull drab with a few buff spots, the digits buff below.

Remarks.—*Atelopus ebenoides ebenoides* resembles *A. bufoniformis* chiefly in its truncate snout and its dark color. The feet are entirely different, however, as *ebenoides* has normally developed toes, while in *bufoniformis* the fourth toe is relatively very long while the others are extremely short and poorly developed. Also, in *ebenoides* the tympanum is distinct anteriorly, while in *bufoniformis* it is hidden under the thick, tuberculated skin. An interesting fact is that one of the two known examples of Colombia *bufoniformis* also comes from Páramo de las Papas, the type locality of *ebenoides*.

An additional example from Tolima, USNM 151325, compares well with the holotype. It is 33 millimeters in length.

Specimens Examined

COLOMBIA

Huila: Páramo de las Papas, 3,600 m., San Agustín, CNHM 69746 (holotype).
Tolima: Near Manizales on old road to Nevada de Ruiz, USNM 151325.

***Atelopus ebenoides marinkellei*, new subspecies**

Plate 18g–i

Holotype.—USNM 150644, an adult from Páramo Vijagual, Boyacá, Colombia, collected by Hno. Nicéforo María.

Paratypes.—USNM 150645–6, same data as holotype.

Diagnosis.—Resembles *Atelopus ebenoides ebenoides* except for its longer snout, projecting upper jaw, more posterior nostril, and the smaller webs between its toes.

Description of holotype.—Head as broad as long; tongue one-third as wide as mouth opening, elongate, oval, its posterior border free and unnotched; snout moderately long, rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis straight, distinct; loreal region slightly concave, vertical, flaring outward to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, slightly greater than interval between nostrils. Tympanum hidden. Fingers moderately long, normally developed, with faint lateral ridges, webbed at base, first finger much shorter than second, fourth longer than second, reaching to base of penultimate phalanx of third; fingers and toes with swollen tips scarcely wider than the phalanges; a small oval thumb pad present; a larger round palmar callus; metacarpal tubercles moderately developed on all except last phalanx of each finger. Toes three-fourths webbed, except inner ones which are completely webbed; third toe a little shorter than fifth, the disk of which reaches to center of antepenultimate phalanx of fourth; a very small round inner metatarsal tubercle and a somewhat larger round outer one; no tarsal ridge; a skinfold on heel and knee. Body rather stout, in postaxillary region narrower than greatest width of head. When arm is adpressed, tip of third toe reaches a point midway between groin and end of body; when hind leg is adpressed, heel reaches axilla; when limbs are laid along the sides, knee and elbow are well separated; when hind legs are bent at right angles to body, heels are slightly separated; when arm is pressed backward, fingers extend beyond groin but not to rear of femur. Skin of upper parts rough with many pointed tubercles on sides of body, sacrum and limbs; top of head fairly smooth; edge of upper eyelids with heavy tubercles; venter finely tubercular on throat and chest and on lower surface of hind legs, the center of the belly with many fine transverse wrinkles; a thick glandular ridge from posterior corner of eye above tympanic area ending above angle of jaw; no apparent skinfold across the chest; a slight ventral disk (?); no external vocal sacs in the male.

Dimensions.—Head and body, 44.5 mm.; head length from angle of jaw, 12.5 mm.; head width, 12.5 mm.; femur, 15 mm.; tibia, 15 mm.; foot, 16 mm.; hand, 11 mm.

Color in alcohol.—Slate color above and below, with a few small white spots beginning on tip of snout, continued as short light stripes along interorbital region and as well-separated spots behind eye, above shoulder insertion, and along dorsolateral region to groin, where there is a much larger light spot that extends also onto anterior proximal part of femur; chin with three large white spots, and chest and belly with four more pairs arranged quite regularly paralleling the middle and continuing onto lower surface of femur; sides of head slate color except for two small light spots on edge of upper eyelid; soles of feet and palms of hands slate with a few light spots, the tips of the digits light also.

Remarks.—The new subspecies from Boyacá differs from the nominate form from Huila mainly in the shape and length of the snout, in the position of the nostril, and in the incision of the toe webs. Neither has a visible tympanum. Otherwise they are very similar in structure and in color. Critical measurements of the new subspecies are inclusive of those of the type of *A. ebenoides* except for the head length, which is slightly less in the latter. It seems clear that, although separated by the Eastern Cordilleras, these two forms are closely related.

This form is named in honor of our friend and colleague, Dr. C. J. Marinkelle.

***Atelopus ignescens* (Cornalia)**

PLATE 22D–F

1834. *Bufo spinulosus* (Wiegman).—*In* Meyen, p. 515, pl. 61, fig. 3 (*fide* Cei, 1958, p. 274).
1849. *Phryniscus ignescens* Cornalia, p. 316 (type locality, "in humid places around Latacunga near Quito," Ecuador).—Jimínez de la Espada, 1875, pl. 1, figs. 7, 7a, 8 (no text).—Philippi, 1902, p. 16.—Nieden, 1926, p. 83.
1858. *Phryniscus laevis* Günther, p. 43, pl. 3, fig. A (type localities, Panama; Quito, Ecuador; Chile); 1859b, p. 417.—Boulenger, 1882a, p. 151; 1882c, p. 463; in Whymper, 1891b, p. 133.—Boettger, 1893, p. 22.—Despax, 1911, p. 39.—Fowler, 1913, p. 164.—Nieden, 1926, p. 83.
1867. *Phrynidium laeve.*—Cope, 1867, p. 196.—Nieden, 1926, p. 83.
1868. *Atelopus laevis.*—Cope, 1868, p. 117.—Boulenger, 1894, p. 375.—Nieden, 1926, p. 83.—Rivero, 1963c, p. 107.
1875. *Atelopus ignescens.*—Jimínez de la Espada, 1875, p. 139.—Boulenger, 1880, p. 46; 1894, p. 375; 1898a, p. 119.—Werner, 1901, p. 600.—Peracca, 1904, p. 19.—Ruthven, 1922, p. 50.—Noble, 1926, p. 2.—Nieden, 1926, p. 83.—Parker, 1934c, p. 268; 1938, p. 440.—Griffiths, 1954, pp. 37, 40, pl. 2, figs. 5, 6.—Rivero, 9163c, p. 107.—Gorham, 1963, p. 24.
1876. *Antelopus laevis.*—Orton, 1876, p. 108, footnote.
1902. *Phryniscus laevia.*—Philippi, 1902, p. 14.

Description.—USNM 118220, an adult male from Guachacal, Nariño, Colombia. Head as broad as long, or nearly so. Tongue one-third as wide as mouth opening, oval, its posterior border free and unnotched; snout acuminate when viewed from above, sloping backwards to border of mouth in profile, the upper jaw extending considerably beyond the lower. Nostrils lateral, projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis short, straight; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter a little greater than its distance from tip of snout; interorbital diameter 1⅓ times that of upper eyelid, equal to interval between nostrils. Fingers moderate, a trace of web between first and second fingers only, but all with lateral ridges, first finger much shorter than second, fourth longer than either, and reaching halfway on penultimate phalanx of third; a very small thumb pad present; a large round palmar callus; metacarpal tubercles well developed. Toes one-half webbed, third toe equal to fifth, both reaching to center of antepenultimate phalanx of fourth; a small but distinct oval inner metatarsal tubercle and a smaller round outer one; subarticular tubercles of toes small and irregular, a few of them double; no tarsal ridge; a heavy skinfold on heel and knee. Body moderately stout, in postaxillary region narrower than greatest width of head. When arm is adpressed, tip of third finger reaches to end of body; when hind leg is adpressed, heel reaches to front of shoulder; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels are narrowly separated. Skin thick, but smooth on head and center of back and upper surfaces; sides of body, top of forearm, and back of femur coarsely granular, some of the granules, especially those on forearm, conical and pointed; venter smooth; a short swollen glandular ridge from posterior corner of eye, ending above shoulder; no skinfold across the chest; no ventral disk; no external vocal sacs in the male, but forearm much enlarged.

Dimensions.—Head and body, 31.5 mm.; head length, 10 mm.; head width, 9.5 mm.; femur, 11.5 mm.; tibia, 12 mm.; foot, 11.5 mm.; hand, 9 mm.

Color in alcohol.—Dorsum vandyke brown, a little darker on eyelids, above canthus, and on upper limb surfaces, and paler along sides of back, but without any distinct markings; venter buff anteriorly to olive buff on lower limb surfaces, immaculate; side of head clay color, the edge of the mouth pale buff; side of body pale clay color, lightening towards the belly; palms of hands and soles of feet wood brown, the tips of the digits and the palmar and plantar tubercles cream color. Soon after preserving, USNM 103242 from Mt. Chimborazo, Ecuador, was blackish olive; throat maize yellow; belly dirty wax yellow; an orange chrome patch on lower proximal femur, crossing posterior part of belly. Some specimens of this lot are almost uniform dull peagreen below; others are sulphur yellow below, with an orange buff femoral pattern.

Remarks.—A comparison of critical measurements of 36 specimens from Ecuador with a like number from Colombia indicated no significant differences. The Colombian frogs had slightly wider heads, but separation would not be advisable on that character alone.

Considerable differences in toe webbing are found in both countries. In Colombia the webs extend from one-third the toe length to the tips, most having the toes one-half webbed. In Ecuador the toes are a little less than one-half to fully webbed, most between one-half and three-fourths webbed. The leg is short in all, as the heel reaches no further than between shoulder and eye, and often only to the axilla, the greatest frequency in both countries falling at the front of the shoulder.

Specimens Examined

COLOMBIA
- Cauca: Near Moscopán, 2,230–2,500 m., USNM 144927–30.
- Córdoba: Catival, upper Río San Jorge, CNHM 61182–3.
- Nariño: Barbacoa, 30 m., Pacific side, CNHM 54304; Cumbal, 10,500 ft., ANSP 25679–705; Encano, 9,500 ft., MCZ 33241; Guachacal, USNM 118220; Guitarilla, 200 m., Patia River side, CNHM 54305, 54307–8; Pasto, USNM 146468; above Pasto, 10,400 ft., MCZ 32340; Ricaurte, 3,900 ft., Pacific side, ANSP 25672; Río Sapuyes, near Túquerres, USNM 118723–4; Túquerres, 3,000 m., Patia River side, CNHM 54309; Volcán Galeras, USNM 141991.

ECUADOR: Guanote, USNM 33866–71; Hacienda Gorzon to foot of Mount Pichincha, ANSP 18282–7; Machachi, MCZ 3001–3; Mount Chimborazo, 4,000 m., USNM 103231–67; mountains above Chimbo, 10,000–10,800 ft., ANSP 18136, 18139–54; Quito, ANSP 18236.

Atelopus varius subornatus Werner

Plate 20d–f

1899. *Atelopus subornatus* Werner, p. 475 (type localities, Alto von Sibaté near Bogotá, 2,800 m., and above Fusagasugá, 2,300 m., Cundinamarca Colombia).—Nieden, 1926, p. 83.—Dunn, 1944a, p 74.—Rivero, 1963c, p. 107.

1899. *Atelopus flaviventris* Werner, p. 475 (type localities, Alto von Sibaté, 2,800 m., Tierra Nigra, Fusagasugá, Cundinamarca, Colombia.—Nieden, 1923, p. 83.—Rivero, 1963c, p. 107.

Description.—USNM 95177, an adult female from Bogotá, Cundinamarca, Colombia. Head longer than broad; tongue very small, one-third as wide as mouth opening, oval, its posterior border free and unnotched; snout straight on the sides, slightly rounded at tip when viewed from above, truncate and sloping backward to border of mouth in profile, the upper jaw extending well beyond the lower. Nostrils lateral, projecting, the nasal openings very small, their distance from end of snout three-quarter their distance from eye. Canthus rostralis sharp, straight; loreal region concave and vertical, scarcely sloping out to the nearly vertical upper lip. Eye large, prominent, its diameter equal to its distance from nostril; interorbital diameter nearly twice that of upper eyelid, approximately equal to interval between nostrils. Fingers moderate in length, webbed at the base, the webs prolonged into lateral ridges extending to finger tips; first finger shorter than second, fourth longer than either and reaching to base of penultimate phalanx of third; a small, indistinct thumb pad present; a large round palmar callus; metacarpal tubercles poorly developed. Toes moderate, one-half webbed, third toe shorter than fifth, which reaches just beyond base of antepenultimate phalanx of fourth; first toe short but distinct and fully webbed; no inner metatarsal tubercle; a small round outer one; subarticular tubercles of toes single, moderately developed; no tarsal ridge; a pronounced skinfold on heel and knee. Body rather stout, in postaxillary region equal to greatest width of head. When arm is adpressed, tip of third finger almost reaches to end of body; when hind leg is adpressed, heel reaches to angle of jaw; when limbs are laid along the side, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts pustular but fairly smooth, the pustules deepest and most apparent on top of head, sacrum, and along the sides; venter smooth; a round flat gland on side well in front of and above the groin; a heavy bony ridge from posterior corner of eye, ending above shoulder; no skinfold across chest; no ventral disks; no apparent vocal sac in the male, but forearm probably developed.

Dimensions.—Head and body, 37.5 mm.; head length, 11 mm.; head width, 9 mm.; femur, 14 mm.; tibia, 13.5 mm.; foot, 12.5 mm.; hand, 9 mm.

Color in alcohol.—Dorsum tawny olive, with small, indistinct sepia spots on occiput and near dorsolateral line; snout, sacrum and most of upper limb surfaces seal brown indistinctly marbled with a lighter brown; venter raw sienna, with 3 irregular longitudinal drab spots on center of throat and chest; sides of body buff with many small russet spots; a clove brown spot on gland just in front of groin; lips immaculate tawny ochraceous; canthal and upper loreal regions pale sepia; palms and soles buff, with a wide sepia spot on outer metatarsal region; no dark crossbars on upper femur or tibia, but instead a heavy sprinkling of small dark brown spots.

Remarks.—This form is in the group having the shortest legs, as its adpressed heel reaches only to the front of the shoulder or to the angle of the jaw. Its hand averages shorter than that of any other Colombian form of *Atelopus* except *spurrelli*, and its head width averages less than any except *varius elegans*. With so few examples, limits of variation cannot now be determined.

Specimens Examined

COLOMBIA

Cundinamarca: Bogotá, USNM 95177.
Magdalena: Santa Marta, 7,800 ft., ANSP 19749–8.

Atelopus pedimarmoratus Rivero

Plate 20g–i

1963. *Atelopus pedimarmoratus* Rivero, p. 121, pl. 3, figs. 5, 8 (type locality, San Isidro, Cundinamarca, Colombia).

Description.—CNHM 81872 (holotype), an adult male from San Isidro, Cundinamarca, Colombia. Head as broad as long. Tongue half as wide as mouth opening, elongate, oval, its posterior border free and unnotched; snout long, rounded when viewed from above, sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis concave, rounded; loreal region concave, vertical, descending to the slightly flaring upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital diameter a little greater than that of upper eyelid, equal to interval between nostrils. Tympanum rather indistinct, its greatest diameter apparently one-fifth that of eye, separated from eye by an interval equal to its own diameter. Fingers moderately long, with weak lateral ridges, free, first finger shorter than second, fourth longer than either, reaching to base of disk of third, which nearly covers the tympanum; a long, oval thumb pad present; a large, flat palmar callus; proximal metacarpal tubercles moderately developed, the distal ones rather weak. Toes one-half webbed, third toe slightly shorter than fifth, the disk of which reaches to center of antepenultimate phalanx of fourth; disk of fourth toe nearly covering the tympanum, and about the same size as that of third finger; a rather flat, oval inner metatarsal tubercle and a smaller round outer one; a narrow, sharp tarsal ridge, ending just before the heel; a skinfold on heel and knee. Body moderately elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches front of shoulder; when arm is adpressed, tip of third finger just reaches to end of body; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overalp. Skin of upper parts smooth on head, heavily pustular on back, sides and upper limb surfaces; venter finely pustular, with small transverse ridges from chin to chest; a sharp glandular ridge from posterior corner of eye above tympanum, ending above angle of jaw; a weak skinfold across the chest; no ventral disk; no external vocal sacs in the male, but thumb swollen and forearm greatly enlarged.

Dimensions.—Head and body, 28.5 mm.; head length, 8.5 mm.; head width, 9 mm.; femur, 11 mm.; tibia, 10.5 mm.; foot, 9.5 mm.; hand, 7.5 mm.

Color in alcohol.—Dorsum fawn color, with an irregular seal brown X-mark from posterior corner of eyelids to shoulders and with other dark irregular markings on the sacrum; surfaces of upper limbs, and sides of head and body heavily marbled with seal brown; chin and throat cinnamon to russet; belly burnt umber with a few large buff spots; lower femur burnt umber; lower limb surfaces seal brown with large buff spots; posterior femur fawn color above to dull burnt umber below; palms of hands and soles of feet wood brown, the disks and lower surfaces of toes buff.

Remarks.—Two rather dried-up specimens (USNM 137531, 144936) tentatively have been identified with this species. In one (USNM 137531), the venter is black with some large white spots; in the other, it is light with black spots. In each, the back has essentially the same dark median chevron as in the type, and the sides of the body are similarly dark. As in so many other species known from but a few examples, more material is needed in order to gauge variability.

Specimens Examined

COLOMBIA

Cundinamarca: San Isidro, CNHM 81872 (holotype).

Cauca: Popayán, USNM 137531; "between Huila and Cauca," Páramo de las Papas, Macizo Central Colombiana, USNM 144936. (Both identified tentatively.)

Atelopus nicefori Rivero

Plate 21g–i

1963. *Atelopus nicefori* Rivero, 1963c, p. 115, pl. 2, figs. 4–7 (type locality, Caicedo, Antioquia, Colombia).

Description.—CNHM 69748 (holotype), a male from Caicedo, Antioquia, Colombia. Head a little longer than broad; tongue very elongate, narrow, about one-fourth as wide as mouth opening, its posterior border free and unnotched; snout long, subacuminate when viewed from above, slanting backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis sharp and straight; loreal region concave, vertical above, and flaring slightly to the upper lip. Eye large, prominent, its diameter a little greater than its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, a trifle greater than interval between nostrils. Tympanum hidden. Fingers rather short, with lateral ridges, free, first finger much shorter than second, fourth longer than either, reaching midway on penultimate phalanx of third; disks bulbous but not enlarged; two or three small tubercles taking the place of a thumb pad; a flat round palmar callus; only the basal metacarpal tubercles well developed, others weak. Toes moderately long, third, fourth, and fifth one-half webbed, inner ones fully webbed; third toe much shorter than fifth, the tip of which reaches to base of antepenultimate phalanx of fourth; fourth and fifth toes considerably reduced in size; a weak, rounded inner metatarsal tubercle and a slightly stronger round outer one; a sharp, thin tarsal ridge, ending near heel; a distinct skinfold on heel and knee.

Body moderately elongate, in postaxillary region a little less than the greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; in adpressed arm, third finger reaches only to end of sacrum and does not extend behind body; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts pustular, the pustules mixed with small tubercles on sides, sacrum, and limbs; venter appearing granular because of the crossing of a great number of fine longitudinal and transverse folds; a heavy glandular ridge from posterior corner of eye above tympanum, ending in a short downward bend above the shoulder; a faint skinfold across the chest; no ventral disk; no external vocal sacs in the male, but first finger swollen and curved.

Dimensions.—Head and body, 25 mm.; head length, 7.5 mm.; head width, 7 mm.; femur, 9 mm.; tibia, 10 mm.; foot, 8.5 mm.; hand, 6 mm.

Color in alcohol.—Dorsum burnt umber with suffusions of russet on the head; an indistinct darker Y-shaped mark from posterior corners of eyelids down the center of the back, apparently forking and continuing diagonally nearly to the sacrum; venter buff, the belly and lower limb surfaces immaculate, the throat with a large diffuse V-shaped wood brown patch; side of head drab, immaculate but with a russet tinge posteriorly; anterior, superior, and posterior limb surfaces burnt umber with slightly darker tips on the small granules where they occur; palms of hands and soles of feet drab gray, with a suffusion of wood brown at base of two outer toes.

Remarks.—The female topoparatype (CNHM 69747) has a throat patch of small dark spots that are better defined than in the male, a definite dark X-mark on the head; and the dark-tipped pustules are heavier and more noticeable on the sides of the head and body.

A male paratype (CNHM 81875, from the Camino Sibaté-Aguadita) has larger and heavier tubercles and a more distinct marbling on the back.

Specimens Examined

COLOMBIA

Antioquia: Caicedo, 1,800 m., CNHM 69748 (holotype), 6977 (paratype).
Province not specified: Camino Sibaté-Aguadita, CNHM 81875 (paratype).

Atelopus spurrelli Boulenger

Plate 19a–c

1914. *Atelopus spurrelli* Boulenger, p. 813, pl. 1, fig. 1 (type locality, near Peña Lisa, Condoto, [Chocó,] Colombia).—Rivero, 1963c, p. 107.

1923. *Atelopus spurrelli certus* Barbour, 1923c, p. 12 (type locality, Mt. Sapo, eastern Panama).—Marx, 1958, p. 426.—Gorham, 1963, p. 25.

Description.—USNM 110958, an adult from Puerto Utría, Chocó, Colombia. Head as long as broad; tongue half as wide as mouth opening, oval, its posterior border free and unnotched; snout bluntly rounded when viewed from above, flat and slanting backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis rounded and slightly concave; loreal region flat, vertical, descending to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter approximately equal to that of upper eyelid, and to interval between nostrils. Tympanum not visible. Fingers moderate, without lateral ridges, free, first finger not well developed, fourth longer than second, its tip reaching beyond base of penultimate phalanx of third; a very indistinct thumb pad present; a weak palmar callus; metacarpal tubercles weakly developed. Toes moderate, one-half webbed, the first and second reduced in size and fully webbed; third toe shorter than fifth, the tip of which reaches beyond base of antepenultimate phalanx of fourth; a small round metatarsal tubercle and an outer one of about the same size and shape; subarticular tubercles of foot small, single, weakly developed; no tarsal ridge; a slight skinfold on heel and knee. Body very slender, elongate, in postaxillary region narrower than greatest width of head. When arm is adpressed, penultimate phalanx of third toe reaches to end of body; when hind leg is adpressed, heel reaches nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts minutely pustular; venter also pustular, the pustules a little larger on posterior belly and below venter; a short bony ridge from posterior corner of eye above tympanic area; no skinfold across the chest, no ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 23.5 mm.; lead length, 7 mm.; head width, 7 mm.; femur, 11.5 mm.; tibia, 12.5 mm.; foot, 8.5 mm.; hand, 6.5 mm.

Color in alcohol.—Dorsum wood brown, with a pale ecru drab median line beginning at tip of snout, forking to anterior eyelid, and continuing as an irregular dorsolateral stripe from posterior eyelid to groin; this light stripe widened above tympanum and containing two small dark spots, and farther back with two rather wide light chevrons connecting the two stripes, each chevron with a diagonal row of dark spots up its center; top of femur with a wide diagonal umber bar, the pale ecru drab area surrounding it with two round dark spots; postanal region with a dark brown chevron, widening below; anterior femur drab, with a sharp demarcation with the paler upper surface; venter cream buff, with small wood brown spots on throat, and elongate olive spots running longitudinally on belly; a sepia lateral line beginning at tip of snout and running along the canthus, enlarged on top of head to the dark spots bordering the median light line of snout, continuing and widening greatly behind eye to groin; upper lip cream buff with two wood brown spots on its margin, below and in front of eye; palms of hands and soles of feet cream buff, with wood brown spots across penultimate phalanges of the three outer toes and fingers; a large brown patch on outer half of tarsus and similar but paler markings on lower surfaces of tibia and femur.

Remarks.—The above-described example is nearly identical with Boulenger's figure of his type specimen from Peña Lisa, Chocó, which was only a half-millimeter longer. Dimensions (in mm.) of a young frog (MLS 172, from Manzanares, Caldas) are as follows: head and body length, 19.5; head length, 6.5; head width, 6.5; femur, 9; tibia, 9.5; foot, 7; hand, 5.5. The light lines on its back are finer and there are fewer spots on its belly; otherwise it closely resembles the Puerto Utría example. Ten specimens from El Valle, Chocó, agree well with the first two mentioned, except that two of them have nearly immaculate bellies. The adpressed heel reaches between the anterior corner of the eye and the nostril in all except one example, in which it reaches only to the center of the eye.

The femur averages a greater proportional length than in any other Colombian atelopid, although it is approached by *A. varius elegans* and *A. v. glyphus* in this characteristic. The tibia is also very long in all three forms.

The probable relationship of this species to *A. varius bibroni* is considered in the discussion under the latter. The characters by which Barbour separated his subspecies *A. spurrelli certus* from nominate *A. spurrelli*—the breaking up of the dark dorsal areas of spots, the finer spotting of the belly in males, and the nearly immaculate belly in females of *certus*—are subject to much variation in examples from both Panama and Colombia. For the present, therefore, it seems best to retain the name *spurrelli* for all of them.

Specimens Examined

COLOMBIA

Caldas: Manzanares, MLS 172.

Chocó: El Valle, USNM 151280–9; Puerto Utría, USNM 110958; Bahía Solono, USNM 144933–5.

Atelopus varius elegans (Boulenger)

Plate 19d–f

1882. *Phryniscus elegans* Boulenger, 1882c, p. 464 (type locality, Tanti, Ecuador, 2,000 ft.); 1882a, p. 155; 1891b, p. 134, text fig.—Nieden, 1926, p. 81.

1894. *Atelopus elegans.*—Boulenger, 1894, p. 375; 1898a, p. 119.—Peracca, 1904, p. 22.—Parker, 1926, p. 553.—Nieden, 1926, p. 81.—Dunn, 1944c, p. 518.—Rivero, 1963c, p. 107.—Gorham, 1963, p. 24.

1905. *Atelopus gracilis* Barbour, p. 102 (type locality, Gorgona Island, Colombia).—Parker, 1926, p. 553.—Nieden, 1926, p. 83.—Griffiths, 1954, pp. 40, 47.

Description.—USNM 52401, an adult female from Gorgona Island, Colombia. Head a little longer than broad, about one-third to one-fourth of the total length; tongue one-third as wide as mouth opening, oval, its posterior border free and unnotched; snout rounded at tip when viewed from above, sloping backwards to mouth in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-third their distance from eye. Canthus rostralis distinct, curved slightly; loreal region concave, vertical, descending to the vertical upper lip border. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Fingers long, webbed at base, with lateral ridges, first finger not well developed and much shorter than second, which is also rather short; fourth finger normal, reaching nearly halfway on penultimate phalanx of third; a small, weak thumb pad present; a larger round palmar callus; metacarpal tubercles not developed. Toes long, one-half webbed, third toe shorter than fifth, which reaches halfway along the antepenultimate phalanx of fourth; a faint, oval inner metatarsal tubercle and a more distinct round outer one; no subarticular tubercles on foot; no tarsal ridge; a heavy skinfold on heel and knee. Body slender, elongate, in postaxillary region narrower than greatest width of head. When arm is adpressed, base of second finger reaches to end of body; when hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts thin, anteriorly nearly smooth; a few granulations on sides and sacral region; venter anteriorly with many minute transverse wrinkles on throat and chest, granulate on posterior belly and lower femur; a weak glandular ridge from posterior corner of eye ending above shoulder; no skinfold across the chest; no ventral disk; no external vocal sacs in the male, but forearm greatly thickened near elbow, so that arm cannot be straightened.

Dimensions.—Head and body, 32.5 mm.; head length, 8.5 mm.; head width, 8 mm.; femur, 14.5 mm.; tibia, 16 mm.; foot, 12.5 mm.; hand, 9 mm.

Color in alcohol.—(ANSP 23177 from Gorgona Island, Colombia, has been chosen for the color description, since USNM 52401 is badly faded.) Dorsum cinnamon, with a white (yellow) dorsolateral stripe beginning at snout tip, continuing on canthus, upper eyelid, above tympanic area and merging with a white inguinal spot; this light stripe bordered above and below by clove brown stripes, the lower brown stripe wide, covering nearly half the side between axilla and groin; a less distinct and somewhat broken dark brown stripe on either side of midline from snout to anus; upper surface of legs and arms fawn color with a network of dark irregular lines not forming real crossbars; anterior and posterior femur buff, unspotted; venter immaculate cream-buff; side of head clove brown in loreal region, the upper lip white, this tone sharply divided from the loreal color; palms and soles immaculate cream-buff.

Remarks.—Some individuals are a little darker or lighter than ANSP 23177, described above; however, there is great uniformity in the pattern elements, as practically all examples at hand show the white dorsolateral stripe edged with dark brown stripes above and below, as well as the more or less irregular dark broken stripes on either side of the midline. The venter is immaculate in all specimens. Variations in the critical measurements are normal.

Specimens Examined

COLOMBIA

CAUCA: Gorgona Island, USNM 52401 (cotype of *Atelopus gracilis* Barbour), 118219, 145132, 145134–230, AMNH 49802–11, 50973–82, ANSP 23176–7; MLS 173.

ECUADOR: Solidero, MCZ 2615, 7605.

Atelopus longibrachius **Rivero**

PLATE 22A–C

1963. *Atelopus longibrachius* Rivero, p. 112, pl. 1, fig. 8 (type locality, El Tambo, Güisito, Cauca, Colombia, 800 m., Pacific side).

Description.—CNHM 54283 (holotype), an adult female from El Tambo, Güisito, Cauca, Colombia. Head as broad as long; tongue one-third as wide as mouth opening, elongate, oval, its posterior border free and unnotched; snout broadly obtuse when viewed from above, sloping backwards in profile, the upper jaw extending well beyond the lower. Nostrils lateral, moderately projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis straight, slightly rounded; loreal region weakly concave, vertical, flaring very slightly to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter nearly twice that of upper eyelid, considerably greater than interval between notrils. Tympanum hidden. Fingers moderately long, with lateral ridges, the second, third and fourth distinctly webbed at base, first and second completely webbed, first finger reduced, much shorter than second, fourth longer than second, reaching halfway on penultimate phalanx of third; fingers and toes with small swollen disks scarcely under the phalanges; a small oval thumb pad present; a larger round palmar callus; metarcarpal tubercles present. Toes moderately long, third, fourth, and fifth almost completely webbed, the others completely webbed; fifth toe longer than third, its disk reaching to base of penultimate phalanx of fourth; a small flat, rounded inner metatarsal tubercle and a slightly smaller round outer one; a weak tarsal ridge, ending midway to heel; a skinfold on heel and knee. Body elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches center of eye; when arm is adpressed, fingers extend behind body by at least the two terminal phalanges of third finger; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts smooth, pustular under the lens, the pustules becoming small granules on sides of head and body and on sacrum; venter weakly granular posteriorly, with many fine transverse and logitudinal wrinkles anteriorly; a wide, rather weak glandular ridge from posterior corner of eye above tympanic area, ending above shoulder insertion; suggestions of a skinfold across the chest; no ventral disk; no external vocal sacs or thickened forearm in the male, but a smooth brown callosity on inner surface of first finger.

Dimensions.—Head and body, 38 mm.; head length, 10 mm.; head width, 10 mm.; femur, 16.5 mm.; tibia, 18 mm.; foot, 14.5 mm.; hand, 12 mm.

Color in alcohol.—Dorsum, sides of body, and upper limb surfaces wood brown with a coarse but regular sepia vermiculation which is concentrated into an irregular, broken dorsolateral stripe beginning at tip of snout, continuing below canthus, above tympanic area and along side of body to groin; rest of side of head olive buff, the anterior and posterior region of the eye sepia; irregular sepia ocelli on anterior and posterior limb surfaces; venter light clay color, the throat, chin and anterior half of belly immaculate, and a few small irregular sepia ocellated spots on its posterior half; palms of hands and soles of feet raw sienna, immaculate.

Remarks.—The large series of 26 paratypes shows remarkable uniformity in color pattern. Many lack the small dark spots on the belly, and some have a wide wood brown area above the dark dorsolateral stripe. The largest example is 43.5 millimeters in total length. The adpressed heel reaches to the center or anterior corner of the eye in most examples, although it may come only to the angle of the jaw in a few, and to a point between eye and nostril in still fewer. The skin at the edge of the upper eyelid is only slightly thickened.

Specimens Examined

COLOMBIA

Cauca: El Tambo, Güisito, 800 m., Pacific side, CNHM 54283 (holotype), 54284–304 (paratypes).

Chocó: Playa de Oro, Río San Juan, 400 m., CNHM 54276–82 (paratypes).

Atelopus varius bibroni (O. Schmidt)

Plate 21d–f

1857. *Hylaemorphus bibronii* O. Schmidt, p. 14, pl. 3, fig. 25 (type locality, New Granada [Darién region of Colombia and Panama]); 1858, p. 256.—Boulenger, 1894, p. 375.—Nieden, 1926, p. 84.

1867. *Phrynidium bibronii.*—Cope, 1867, p. 196.—Nieden, 1926, p. 84.

1963. *A.[telopus] bibronii.*—Rivero, 1963c, p. 108.

Description.—USNM 147505, a female from Medellín, Antioquia, Colombia. Head a little longer than broad. Tongue slender, one-third as wide as mouth opening, obovate, its posterior border free and unnotched; snout obtusely pointed when viewed from above, and with the tip projecting in profile, the upper jaw extending far beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis sharp; loreal region slightly concave and vertical, continuous with the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1⅓ times that of upper eyelid and a trifle wider than interval between nostrils. Fingers moderately long, webbed at the base, with very wide lateral ridges, first finger much shorter than second, fourth longer than either and reaching halfway on penultimate phalanx of third; a small round thumb pad present; a large round palmar callus; metacarpal tubercles well developed. Outer toes one-half webbed, fifth toe a little longer than third, its tip reaching almost to penultimate phalanx of fourth; first toe distinct but entirely webbed; a small oval inner metatarsal tubercle and a smaller round outer one; subarticular tubercles of foot small, single, less developed than those of hand. No tarsal ridge; a heavy skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When arm is adpressed, tip of third finger reaches a point between groin and end of body; when hind leg is adpressed, heel reaches to angle of jaw; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels touch. Skin of upper parts heavily glandular, with numerous small conical tubercles on sides of body, sacrum, and upper limb surfaces; venter finely granular on throat and chest, coarsely granular on belly and lower femur; a short, heavy, bony ridge from posterior corner of eye above tympanic area, ending just above angle of jaw. No skinfold across the chest; no ventral disk; no external vocal sacs in the male, but forearms thickened near elbow.

Dimensions.—Head and body, 33 mm.; head length, 10 mm.; head width, 8.5 mm.; femur, 13 mm.; tibia, 14 mm.; foot, 11.5 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum immaculate vandyke brown in this specimen; belly light clay color; chin and throat sepia; lower surfaces of arms and legs pale sepia except for proximal area of femur including postanal region, which is clay color like the belly, and with a sharp division between the two colors across the lower proximal part of femur, sides of body vandyke brown, with a serrate border where this color meets the ventral tone; side of head dull vandyke brown, with a lighter area in front of eye extending to border of upper lip and a more distinct clay colored spot at commissure of jaws; no crossbars on legs, but a darker brown color around the base of each tubercle; palms of hands and soles of feet sepia, with the webs and tubercles light clay color.

Variation.—Four of the other examples from Antioquia are immaculate vandyke brown above, like the described specimen, and the remainder have large or small light dorsal spots, usually concentrated on the snout and parietal region, with a more or less apparent light dorsolateral line and with faint traces of dark and light crossbars on the legs. MLS 170 from Cundinamarca has a slightly smoother skin, while the tip of its snout is less pointed than others of similar size from Antioquia. These small differences, however, do not warrant its separation as a subspecies.

Remarks.—There is a definite suggestion of relationship between *Atelopus varius bibroni* and *A. spurrelli* in body proportions as well as in color pattern. Both have the wide dark brown lateral stripe, but in the lighter examples of *A. v. bibroni* the back (between these stripes) has no pale chevrons outlining more or less regular dark patches; instead, there are irregular elongate dark spots arranged haphazardly in three rows, or the back may be uniformly dark as in the described specimen.

Colombian Specimens Examined

AMAZONAS: Río Apaporis, USNM 144931–2 (juv.).

ANTIOQUIA: Andes, AMNH 14149; Antioquia, AMNH 3208; Medellín, AMNH 1340, 1345–6, 1377–8, 13537–8, 39088, USNM 147505.

BOLÍVAR(?): Probably upper Sinú River, CNHM 61755 (juv.).

CALDAS: Laguneta, ANSP 25365–8; Pereira, MLS 312–3; Quindío, MLS 171.

CUNDINAMARCA: MLS 170.

CAUCA: El Tambo, ANSP 25369 (tentatively identified).

NARIÑO: Ricuarte, ANSP 25362, 25671 (tentatively identified).

Atelopus carrikeri Ruthven

Plate 22 g–j

1916. *Atelopus carrikeri* Ruthven, p. 1, pl. 1 (type locality, Páramo de Macostama, Santa Marta Mountains, [Magdalena,] Colombia; 1922, p. 5.—Dunn, 1944c, p. 518.—Rivero, 1963c, p. 107.—Gorham, 1963, p. 24.

Description.—MCZ 4100 (paratype), an adult male from Don Diego, Magdalena, Colombia. Head as long as broad, its length about one-third of total length; tongue approximately two-fifths as wide as mouth opening, stalked, its posterior border free and unnotched; snout rather acuminate when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, scarcely projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis rounded but strongly developed; loreal region vertical, concave, its lower part flaring very slightly to the upper lip. Eye large, prominent, its diameter four-fifths its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid and a trifle greater than interval between nostrils. Fingers thick, fairly long, with lateral ridges, free, first finger shorter than second, fourth longer than either and reaching halfway on penultimate phalanx of third; a small oval thumb pad present; a large round palmar callus; metacarpal tubercles absent. Outer toes one-half webbed, thick, short, third toe a little shorter than fifth, the tip of which reaches halfway on antepenultimate phalanx of fourth; first toe distinct, entirely webbed; a blunt oval inner metatarsal tubercle and a smaller round outer one; subarticular tubercles mostly double, not strongly developed; no tarsal ridge; a heavy inner skinfold on heel and knee. Body fairly stout, in postaxillary region a little narrower than greatest width of head. When arm is adpressed, tip of third finger reaches to end of body; when hind leg is adpressed, heel reaches slightly beyond axilla; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to the body, heels are separated. Skin of upper parts thick but smooth; a patch of small spicules behind lower jaw, extending on shoulder and to forearm and elbow; ventor smooth; a low glandular swelling from tip of snout along canthus to posterior tympanic area, where it ends in a swollen gland. No skinfold across the chest; no ventral disk; no external vocal sacs in the male, but forearm greatly enlarged near elbow.

Dimensions.—Head and body, 51.5 mm.; head length, 15.5 mm.; head width, 15.5 mm.; femur, 17 mm.; tibia, 18.5 mm.; foot, 19 mm.; hand, 14 mm.

Color in alcohol.—Dorsum uniform blackish slate; venter uniform slate gray excepting for a pale round spot on each side of chin below mouth commissure; palms and soles slightly lighter gray.

Remarks.—The specimens examined are dark brown to blackish slate above except USNM 123560 (see Plate 22J) which has a dorsal pattern of striking large black and white (yellow in life) spots. In all other respects USNM 123560 resembles the other specimens from Magdalena.

In the critical measurements, variation is not great, even considering the fact that the series examined consists of only 11 examples.

Specimens Examined

COLOMBIA

MAGDALENA: Don Diego, MCZ 4100; Mamancanaca Valley, 10,900 ft., USNM 118725–6; AMNH 50965–7; Páramo de Surubaka, 4,000 m., and glaciers, 4,800 m., Sierra Nevada de Santa Marta, Uscátegni, USNM 145744–5; Río Guatapurí, Sierra Nevada de Santa Marta, USNM 123560–2.

***Atelopus varius glyphus* Dunn**

PLATE 21A–C

1931. *Atelopus varius glyphus* Dunn, p. 396 (type locality, Pirri Range, near head of Río Limón, Darién, Panama).—Breder, 1946, p. 409.

Description.—USNM 50230 (holotype), an adult male from the Pirri Range near the head of Río Limón, Darién Province, Panama. Head a little longer than broad. Tongue small, one-third as wide as mouth opening, oval, its posterior border free and unnotched; snout moderate, squarely truncate when viewed from above, straight and nearly vertical in profile, the upper jaw extending considerably beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-fifth their distance from eye. Canthus rostralis distinct; loreal region vertical concave, merging with the nearly vertical upper lip. Eye large, prominent, its diameter three-fourths its distance from tip of snout; interorbital diameter 1⅔ times that of upper eye lid, a little greater than interval between nostrils. Fingers long, their tips swollen into small disks, webbed at base, with faint lateral ridges, first finger very small but distinct, reaching penultimate phalanx of second, fourth longer than second, reaching halfway on antepenultimate phalanx of third; thumb pad and palmar callus very faint; metacarpal tubercles not developed. Toes moderate, first toe small but distinct, third a trifle longer than fifth, its disk reaching a little distance along antepenultimate phalanx of fourth, first and second entirely webbed, third to fifth one-half webbed, with last three phalanges of fourth free; toes scarcely swollen into disks; a small blunt oval inner metatarsal tubercle and a smaller round outer one; subarticular tubercles of toes single, weakly developed; no true tarsal ridge; a distinct skinfold on heel and knee. Body elongate, in postaxillary region a little narrower than greatest width of head. When arm is adpressed, tip of second finger reaches to end of body; when hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts smooth, except for some small transverse glands on sacrum; venter smooth, except for weak granules below anus; a bony ridge from posterior corner of eye ending above shoulder, and followed by a large squarish gland just above arm insertion; a slight skinfold across chest; a faint ventral disk; no external vocal sacs, but forearm of male developed for clasping.

Dimensions.—Head and body, 44 mm.; head length, 12.5 mm.; head width, 11.5 mm.; femur, 18.5 mm.; tibia 19.5 mm.; foot, 17 mm.; hand, 13.5 mm.

Color in alcohol.—Dorsum cinnamon, uniform except for some small scattered guanine spots; venter light ochre yellow, immaculate; a few indistinct olive crossbars and spots on legs; upper lip, canthal region, upper eyelids and gland above shoulder pale ochre.

Remarks.—Some of the paratypes that are smaller and younger than the type have rather elaborate patterns. In USNM 54191, from Cerro Azul, Darién Province, Panama, the ground color of dull sage green is nearly obscured by three very wide clove brown chevrons, the point of the anterior one produced into a wide, dark interorbital patch; similar dark crossbands nearly encircle the legs, being broken for only a short distance on the lower femoral surface; venter olive buff with a double row of small brown spots along its midline from chin to posterior abdomen; canthal and loreal regions dark brown, the rest of the upper lip olive buff. The Colombian specimens, none of which seem to be very old, resemble USNM 54191 very closely. except that the small brown dots on the belly are more scattered ANSP 25626 lacks ventral spots.

Usually the toes are about one-half webbed, but the webbing appears to be more deeply incised in some individuals.

Specimens Examined

COLOMBIA

Chocó: Upper Río Jurubida, ANSP 25626–31.

PANAMA: Cana, USNM 50168–75, 50226, 54230 (paratypes); Cerro Azul, USNM 54191–6 (paratypes), 140058–9; Pirri Range near head of Río Limón, Darién, USNM 50230 (holotype), 50231–48 (paratypes); Porto Obaldia, USNM 48594–5; Río Jappe, near Cana, USNM 53964 (paratype); Siola, Chiriquí, 4,200 ft. ANSP 24245.

***Atelopus longirostris* Cope**

Plate 12d–f

1868. *Atelopus longirostris* Cope, p. 116 (type locality, Valley of Quito, Ecuador).—Jimínez de la Espada, 1875, p. 155, pl. 2, figs. 1–1d, 2–2c.—

Orton, 1876, p. 100, footnote.—Boulenger, 1894, p. 375.—Werner, 1901, p. 600.—Nieden, 1926, p. 81.—Rivero, 1963c, p. 107.—Gorham, 1963, p. 25.

1901. *Atelopus longirostris marmorata* Werner, p. 600 (type locality, Ecuador).—Nieden, 1926, p. 81.

1963. *Atelopus* l.[*ongirostris*] *marmoratus*.—Rivero, 1963c, p. 108.

Description.—CNHM 43850, an adult male from Cisneros, Valle, Colombia. Head flat above, its length about 1¼ times its width, due to elongated snout; tongue a little less than half as wide as mouth opening, very long, spatulate, its posterior border free and unnotched; snout bluntly pointed when viewed from above, nearly right-angled at tip, concave and receding in profile, the upper jaw extending considerably beyond the lower. Nostrils lateral, small, scarcely projecting, their distance from end of snout equal to their distance from eye. Canthus rostralis straight and sharp; loreal region slightly concave, descending almost vertically to the upper lip. Eye large, prominent, its diameter about seven-eighths its distance from tip of snout; interorbital diameter nearly three times that of upper eyelid, a little greater than interval between nostrils. Tympanum not very distinct, its greatest diameter one-third that of eye, separated from eye by an interval equal to its own diameter. Fingers rather long, slender, with lateral ridges, the three outer ones webbed at base, first and second one-half webbed and quite short, first finger much shorter than second, fourth longer than either and reaching to base of penultimate phalanx of third; finger disks bulbous but not greatly enlarged; a small oval thumb pad present; a flat, round palmar callus; metacarpal tubercles poorly developed. Toes long, one-half webbed, the outer two entirely webbed, third and fifth subequal, their tips reaching to base of antepenultimate phalanx of fourth toe; a small oval inner metatarsal tubercle and a larger rounded outer one; apparently a tarsal ridge, ending near heel; a skinfold on heel and knee. Body elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel probably reaches to center of eye (not possible to acertain in the stiffened specimen); when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts thin, pustular under the lens, adhering to vertebrae, which are very prominent; venter finely pustular, with coarse pustules on chin and throat and wrinkles on belly; a sharp glandular ridge from posterior corner of eye, projecting above tympanum, ending above shoulder; a light skinfold across the chest; no ventral disk.

Dimensions.—Head and body, 46.5 mm.; head length, 14 mm.; head width, 13 mm.; femur, 19.5 mm.; tibia, 19.5 mm.; foot, 14.5 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum clove brown, almost black, with a cinnamon stripe beginning at tip of snout, continuing along canthus, on upper eyelid, on postocular ridge and along side of body to groin, its borders irregular on the body; a cinnamon line along the back from nuchal region onto the sacrum; side of head clove brown with an elongate cinnamon spot on upper lip in front of eye and a larger round spot below tympanum; sides of body clove brown above, lightening to vandyke brown below, rather sharply set off from the paler ventral color; venter buff, immaculate on belly, with a large chevron-shaped russet patch covering most of chin and dying out on chest; upper limb surfaces clove brown to black, with some cinnamon spots especially prominent on upper arm; anterior femur with an irregular ecru drab stripe edged below by a vandyke brown stripe continued from side of body; posterior femur with alternating dark and light squarish spots; soles of feet and palms of hands deep brown to black on outer toes, lightening to wood brown below inner digits and on their tips.

Remarks.—The other specimen from Cisneros, Valle (CNHM 43851, a female distended with eggs) is lighter in color than the male (CNHM 43850), being wood brown above and on the sides, with a coarse sepia X-mark from the upper eyelids to a point well behind the level of the axillae. The venter is olive-buff. The throat and chest have a clay-colored outline of a "chevron" consisting of an irregular median line from tip of chin to breast, with other spots in an irregular ( )-shaped arrangement on each side. Markings on the limbs are clouded and indistinct.

The first finger is more distinct in the female, but this is due to the swelling of that digit in the male. The first and second fingers in both male and female are much broader and have wider tips than the third and fourth fingers. No external vocal sacs apparent in the male, but inner finger enlarged.

As Rivero (1963c., p. 112) has remarked, these examples "more or less agree" with Cope's original description. They are so badly stiffened and mutilated that Cope's statements as to the extension of the fore and hind limbs, backward and forward, cannot be checked. The faint tarsal fold mentioned by Cope apparently exists in CNHM 43851 as a thin ridge of skin, but the ridge on this shrunken and dried specimen may be much stronger than the ridge on fresher material.

Specimens Examined

COLOMBIA

VALLE: Cisneros, 100 m., CNHM 43850–1.

SANTANDER: Hacienda Barrancas, Quebrada La Lechera, tributary of Río Opón, Vélez, 900 m., USNM 144937–40 (tentatively identified).

Atelopus walkeri Rivero

Plate 20a–c

1963. *Atelopus walkeri* Rivero, 1963c, p. 117, pl. 3, figs. 1–4 (type locality, Don Diego, Santa Marta region, [Magdalena,] Colombia).

Description.—MZUM 48007 (holotype), a male from Magdalena, Colombia. Tongue one-third as wide a mouth opening, oval, its posterior border free and unnotched; snout broadly acuminate when viewed from above, straight and slanting backwards in profile, the upper jaw extending far beyond the lower. Nostrils lateral, strongly projecting, their distance from end of snout nearly as great as their distance from eye. Canthus rostralis distinct, curved; loreal region concave, vertical, descending to the upper lip. Eye large, prominent its diameter a trifle less than its distance from tip of snout; interorbital diameter twice that of upper eyelid, much greater than interval between nostrils. Tympanum hidden. Fingers rather long, the tips slightly bulbous, with weak lateral ridges, free, first finger much shorter than second, fourth longer than either and reaching nearly to base of penultimate phalanx of third; a small oval thumb pad present; a large, flat palmar callus; metacarpal tubercles well developed. Toes moderately long, their tips bulbous, one-half webbed, third and fifth subequal, their tips reaching beyond base of antepenultimate phalanx of fourth toe; a small oval inner metatarsal tubercle and a smaller rounded outer one; a weak tarsal ridge, ending before reaching heel; heavy skinfolds on heel and knee. Body fairly stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; third finger when adpressed reaching just beyond groin; when limbs are laid along the sides, knee and elbow just touch; when hind legs are bent at right angles to body, heels are slightly separated. Skin of upper parts fairly smooth (pustular under lens), with some low tubercles on head and a parotoid swelling behind the eye; a weak middorsal ridge; venter smooth except for some minute transverse wrinkles on belly, and granules below anus; a heavy glandular ridge from posterior corner of eye along parotoid area, ending above shoulder; a weak skinfold across the chest; a slight ventral disk; an external vocal sac in the male.

Dimensions.—Head and body, 39 mm.; head length, 12 mm.; head width, 11 mm.; femur, 15.5 mm.; tibia, 15.5 mm.; foot, 15 mm.; hand, 10.5 mm.

Color in alcohol.—Dorsum light clay color, with many small sepia dots on the head tubercles, forming a broken midline from snout tip to anus where it forks and continues on back of femur; a faint chevron of dark dots above shoulders; a heavier lateral sepia stripe from tip of snout along canthus, behind eye, along sides to groin; concentrations of pale sepia spots on upper proximal half of femur and across tibia and foot; upper half of posterior femur pale buff, lower half sepia, the two colors irregularly divided; side of head mottled with pale sepia; edge of upper lip white with a darker sepia line just above it; olive buff with small sepia spots on chest, and larger ones on belly, seemingly arranged in broken transverse series; a large sepia postanal patch; lower surfaces of tibia and foot with sepia vermiculations; palms of hands and soles of feet olive-buff, the tips of the digits a little darker.

Remarks.—As suggested by Rivero, *Atelopus walkeri* resembles the Venezuelan *A. oxyrhynchus* and *A. cruciger cruciger* rather closely, although *oxyrhynchus* has larger glandular warts on the flanks and less webbing between the toes, and *cruciger cruciger* has a very distinctive dark dorsal pattern. *A. cruciger vogli* is rougher dorsally and has longer limbs, as the adpressed heel reaches the nostril or snout tip and the third finger reaches well beyond the end of the body.

The similarity of *A. walkeri* and *A. subornatus* also was discussed by Rivero. The only available Bogotá example of the latter (USNM 95177) has the third finger extending slightly beyond the end of the body, and the inner and outer metatarsal tubercles are distinct only when the foot is bent. The tubercles below the digits are distinct, but this may be due to the preservation.

The holotype is the only known example of *A. walkeri*.

Family Hylidae

Frogs with procoelous vertebrae, a double condyle on the coccyx; arciferal girdle, short intercalary cartilages between the ultimate and penultimate phalanges, and claw-shaped terminal phalanges.

From the four other families of frogs with intercalary cartilages this family may be distinguished as follows: from the Centrolenidae in having the terminal phalanges claw-shaped rather than T-shaped; from the Pseudidae in having the intercalary cartilages disk-like rather than elongate and rod-like; and from both the Rhacophoridae and Phrynomeridae in being procoelous and arciferal rather than diplasiocoelous and firmisternal.

Key to Colombian Genera of Hylidae

a^1. Pupil horizontal.
b^1. Roof of skull exostosed.
c^1. No teeth on parasphenoid.
d^1. Vocal pouch paired.
e^1. A well-developed helmet . . . . **Cerathyla**
e^2. No well-developed helmet . . . . **Osteocephalus**

d^2. Vocal pouch unpaired . . . . **Gastrotheca**
c^2. Teeth on parasphenoid . . . . **Tetraprion**
b^2. Roof of skull not exostosed.
c^1. Vocal pouches with no tendency to be paired.
d^1. Sacral diapophyses expanded.
e^1. Males with vocal pouch on the posterior margin of the throat region made of a number of longitudinal folds bounded anteriorly and posteriorly by transverse folds; snout pointed and projecting . . . . **Sphaenorhynchus**
e^2. Males with vocal sac single but not bounded anteriorly and posteriorly by transverse folds; in most species snout not strikingly pointed and projecting . . . . **Hyla**
d^2. Sacral diapophyses rounded.
e^1. Tympanum quite distinct . . . . **Cryptobatrachus**
e^2. Tympanum indistinct or absent . . . . **Hyloscirtus**
c^2. Vocal pouches either at angles of jaws or, if subgular, with a strong tendency to be paired.
d^1. Vocal pouches at angles of jaws . . . . **Phrynohyas**
d^2. Vocal pouches not at angles of jaws . . . . **Smilisca**
a^2. Pupil vertical.
b^1. Palpebral membrane reticulate (except in *A. calcarifer*), first toe shorter than second . . . . **Agalychnis**
b^2. Palpebral membrane not reticulate, first toe longer than second (except in *P. bicolor*) . . . . **Phyllomedusa**

Genus *Agalychnis* Cope

1864. *Agalychnis* Cope, p. 181 (type species, *Hyla callidryas* Cope).

Generic diagnosis.—The frogs of this genus may be characterized by the following combination of characters: vertical pupil; palpebral membrane reticulate in all except *A. calcarifer*; tongue extensively free behind; webbing more or less well developed on hands; first toe shorter than second; vocal pouch of male median and subgular; eyes red in life in many of the species.

Key to Colombian Species of *Agalychnis*

a^1 A prominent triangular dermal appendage on heel; three phalanges of fourth toe free or nearly free of webs; palpebral membrane not reticulate.
A. calcarifer
a^2. No prominent triangular appendage on heel; no more than one phalanx of fourth toe entirely free of web; palpebral membrane reticulate.
A. spurrelli

Agalychnis calcarifer Boulenger

PLATE 23A

1902. *Agalychnis calcarifer* Boulenger, p. 52 (type locality, Río Durango, Northwestern Ecuador).—Nieden, 1923, p. 335.—Dunn, 1931, p. 415.
1950. *Phyllomedusa calcarifer*.—B. Lutz, 1950, p. 601.—Funkhouser, 1957, p. 24.—Gorham, 1963, p. 23.

Diagnosis.—An *Agalychnis* with the first toe shorter than the second, extensively webbed fingers, a sloping snout, and a triangular dermal appendage on the heel.

This species differs from all other Colombian frogs with vertical pupils except *A. spurrelli* by the presence of extensive webbing between the fingers. From *spurrelli* it differs in having a prominent triangular dermal appendage on the heel and a glandular fold above the vent. In pattern it differs in having no reticulations on the palpebral membrane, in having blackish, finger-like projections from the dorsal ground color onto the ventral light color, in having pigment under the fourth finger and under the metatarsal region of the fourth and fifth toes, in the presence of brown patches on each side and below the vent, and in lacking the clear white, black-encircled, distinct, scattered spots on the back.

Description.—BM 1913.11.12.126, from Peña Lisa, Condoto, Chocó, Colombia. Vomerine teeth in two small, slightly elongate series, the outer ends more anterior so that together they form a broken V between the moderate-sized, squarish choanae; tongue half as wide as mouth opening, elongate, its posterior border extensively free and deeply notched. Snout rather small, broadly triangular when viewed from above, sloping in profile, the upper jaw not projecting beyond lower; nostrils more lateral than superior, very slightly projecting, a little closer to tip of upper lip than to eye, separated from each other by an interval slightly less than their distance from eye. Canthus rostralis slightly defined; loreal region somewhat concave and nearly vertical. Eye moderate, not particularly prominent, its dismeter equal to its distance from nostril; pupil vertical; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is not particularly wide and about equal to distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye and nearly in contact with it. Fingers extensively webbed, web reaching middle of penultimate phalanx on lateral side of fourth finger, which is considerably longer than second, reaching to middle of disk of third, which more than covers the tympanic area; no projecting rudiment of a pollex; a well-developed ulnar ridge extending from tip of fourth finger along outer arm to elbow. Toes more than one-half webbed, the web on fourth toe reaching the middle of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe practically covering the tympanic area; first toe shorter than second, not opposable; a distinct oval inner and a very small but distinct rounded outer metatarsal tubercle; a well-developed tarsal ridge extending from tip of fifth toe along outer margin of foot to heel where it terminates in a prominent triangular dermal appendage. Body elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap appreciably; when hind legs are bent at right angles to body, heels overlap somewhat. No patagium. Skin of upper parts finely granular, a moderately heavy glandular fold (parotoid) hangs behind the tympanum and angle of jaw to about the level of the lower margin of jaw, a distinct (glandular?) flap extends out above the vent. Skin of throat and chest smooth, that of belly and lower femur uniformly granular; no apparent traces of a skinfold across the chest; no inguinal gland; no apparent vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 62.7 mm.; head length, 19.2 mm.; head width, 21.3 mm.; femur, 31.9 mm.; tibia (exclusive of dermal flap), 33.7 mm.; foot, 42 mm.; hand 21.4 mm.

Color in alcohol.—A nearly uniform dorsal dark color, very sharply separated from the uniform (with exceptions noted below) ventral light color; a series of black, narrow, finger-like projections extending downward from the dark dorsal color into the ventral light color. The dorsal dark color is now a deep blue and completely covers the top of the head and back. There are margins of this dorsal color along the margin of the lower jaw, along the upper surface of the forearm and the lateral dorsal surface of the fourth finger; a narrow stripe of this dorsal color extends from the hip along the dorsal margin of the thigh to the knees. The dorsal surface of the shank bears the dorsal ground color, as does the dorsal surface of the metatarsal region and the dorsal surface of the fifth toe. There is a pencil stripe along the distal dorsal portion of the upper arm. A series of about half a dozen black, finger-like processes extend down from the dorsal ground color between the head and groin; a similar number extend down both anteriorly and posteriorly from the stripe of dorsal color on the thigh, on the inner (but not outer) margin of the shank, and several are present on top of the foot, with a similar splash on the middle of each fifth toe. The pale ventral ground color is interrupted only by some brown markings on the ventral surface of the wrist and fourth finger and by some brown spots slightly below and on each side of the vent, on the ventral surface of the metatarsal region, the base of the fourth toe, and the entire fifth toe.

Variation.—The variation in the adult specimens is nearly imperceptible. In the two adults at hand, BM 1902.5.27.26 [1947.2.24.22], the type, and BM 1913.11.12.126), the only perceptible difference is that the type has a little more pronounced fold over the vent and a little shorter snout. Color-wise, the two are exactly alike except that the type lacks the pencil-like stripe along the distal, dorsal surface of the upper arm.

Specimens Examined

COLOMBIA

Chocó: Condoto, Peña Lisa, BM 1913.11.12.126.

ECUADOR: Río Durango, northwestern Ecuador, BM 1902.5.27.26 [1947.2.24.27], the type.

Agalychnis spurrelli Boulenger

Plate 23B

1913. *Agalychnis spurrelli* Boulenger, p. 1024 (type locality, Peña Lisa, Condoto Chocó).—Dunn, 1931, p. 415.

1957. *Phyllomedusa spurrelli*.—Funkhouser, 1957, p. 39.—Gorham, 1963, p. 24,

Diagnosis.—An *Agalychnis* with the first toe shorter than the second, no dermal heel appendages, no pronounced glandular fold above the vent although there is a glandular swelling, extensively webbed fingers, and a sloping snout. It differs from all Colombian phyllomedusids except *A. calcarifer* in the presence of extensively webbed fingers. It differs from *A. calcarifer* in lacking the two prominent triangular dermal heel appendages; in having distinct, clear white, black-encircled, round spots scattered over the dorsum; in having the palpebral membrane reticulate; in lacking the black, finger-like projections from the dorsal ground color into the ventral light surface; and in lacking any trace of pigment on the soles of the hands and feet.

Description.—BM 1913.11.12.129 [1947.2.24.24], (cotype), from Peña Lisa, Condoto, Chocó, Colombia. Vomerine teeth in two small, slightly elongate series, the outer ends more anterior so that together they form a very broad broken \/ between the moderate-sized, squarish choanae; tongue half as wide as mouth opening, elongated, its posterior border extensively free and shallowly notched. Snout moderate, broadly triangular when viewed from above, somewhat sloping in profile, the upper jaw not extending beyond lower; nostrils more lateral than superior, very slightly projecting, half again as far from eye as from tip of upper lip, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis slightly defined; loreal region somewhat concave and somewhat oblique, the upper lip flaring out slightly below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostrils; pupil vertical; interorbital distance half again as great as width of upper eyelid, equal to distance between nostril and eye, upper eyelid not particularly broad, equal to distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, and practically in contact with it. Fingers extensively webbed, web reaching nearly to base of disk on lateral side of the fourth finger, fourth considerably longer than second, reaching to middle of disk of third which covers nearly twice the tympanic area; no projecting rudiment of a prepollex; an ulnar fold runs from elbow along outer margin of forearm and hand to tip of fourth finger. Toes fully webbed, the web on fourth toe reaching nearly to base of disk, web on all other toes reaching to disk, third and fifth toes subequal, disk of fourth toe covering half again the tympanic area; first toe shorter than second, not opposable, a distinct oval inner but no apparent outer metatarsal tubercle; a well-developed tarsal ridge extending from tip of fifth toe along outer margin of foot to heel; no dermal appendage on heel. Body elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to tip of snout; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap considerably. No patagium. Skin of upper parts very finely glandular; a moderately heavy glandular fold (parotoid) hangs behind the tympanum and angle of jaw to about the level of lower margin of jaw; a pair of slightly projecting, rounded, glandular areas just above the vent, but these not projecting out as a conspicuous ridge or appendage; skin of throat and chest smooth, that of belly and lower femur uniformly granular; no apparent traces of a skin-fold across chest; no apparent vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 92.8 mm.; head length, 28.2 mm.; head width, 29.3 mm.; femur, 43.3 mm.; tibia, 48 mm.; foot, 63.2 mm.; hand, 27.4 mm.

Color in alcohol.—A rather somber colored frog for an *Agalychnis*, now a pale bluish above and pale yellowish below with no sharp line of demarcation between dorsal and ventral colors. The dorsal color is over the entire dorsal surface of head and body, in a narrow line margining the lower lip, a line on the upper surface of forearm and fourth finger, a trace of pigment on third finger, a narrow stripe along the dorsal surface of thigh, a stripe along the margin of dorsal surface of metatarsal region and on dorsal surface of fourth and fifth toes (except on tip of fourth toe). The tarsal and ulnar folds are whitish, and there are three very brilliant, clear white, black-encircled spots on the back. The palpebral membrane is reticulated.

Variation.—The four specimens in the type series comprise two adult females, an adult male, and a juvenile. The male differs in having a well-developed, brown, horny pad on the underside of the thumb and seems in general to be slightly more slender in build than are the two adult females. The immature specimen (27.8 mm.) has faded to a lavender rather than a pale blue color, but it is patterned like the adults.

The series of eight fresh specimens (CJG 2433–40) from the Río

Manso, Córdoba, collected by Fred Medem, adds to our knowledge of variation in this rare species. Two breeding females in the series have head and body lengths of 62.4 and 66.3 mm., while the males range from 47.2 to 51.2 mm. in head and body length. Both females and three of the males have the gaudy, rounded, black-bordered white spots on the back as do those in the type series; and all the males exhibit the brown patch on the inner side of the thumb, but this patch is missing in both females.

Remarks.—Boulenger (1913, pp. 1024, 1025) described and illustrated amplexus and the breeding process in this species. The leaf, with the eggs attached, is still present with the type series.

Specimens Examined

COLOMBIA

CHOCÓ: Peña Lisa, Condoto, BM 1913.11.12.127–30 (two specimens were labeled as types in 1947 as 1947.2.24.24–5).
CORDOBA: Río Manso, CJG 2433–40.

Genus *Cerathyla* Jimínez de la Espada

1871. *Cerathyla* Jimínez de la Espada, p. 63 (type species, *Cerathyla bubalis* Espada).

Generic diagnosis.—A well-developed helmet but derm of head not co-ossified with skull; teeth or odontoids present on mandible and palatines; expanded digital pads present; eye placed midway between tip of snout and angle of jaw.

Key to Colombian Species of *Cerathyla*

a^1. Proboscis and superciliary processes in adults about 4 mm. in length; tympanum separated from eye by its own greatest diameter (height) rather than its least diameter (width). . . . . . . **C. proboscidea**
a^2. Proboscis and superciliary processes in adults about 2 mm. in length; tympanum separated from eye by its least diameter (width). . **C. johnsoni**

Cerathyla proboscidea Jimínez de la Espada

PLATE 23F–H

1871. *Cerathyla proboscidea* Jimínez de la Espada, p. 64 (type locality not given); 1875, pl. 5, fig. 2; 1899, p. 399.—Boulenger, 1882a, p. 453.—Gadow, 1901, p. 211.—Nieden, 1923, p. 360.—Myers and Carvalho, 1945, p. 21.—Gorham, 1963, p. 21.
1945. *Ceratohyla cristata* Andersson, p. 18 (type locality, Río Pastaza, Ecuador).—Gorham, 1963, p. 21.

Diagnosis.—A *Cerathyla* with a long fleshy proboscis and elongated, fleshy superciliary processes.

This species may be distinguished from *C. johnsoni*, the other Colombian species of the genus, by having the proboscis and superciliary process in adults about four millimeters long instead of about 2 millimeters long and by having the tympanum separated from the eye by its height (long diameter) rather than by its width.

Description.—BM 1910.7.11.71, from Río San Juan, Chocó, Colombia. Vomerine teeth in a pronounced V-shaped structure, anterior teeth in both series enlarged in a definite patch, palatine teeth in two well-developed series nearly in contact medially and passing laterally nearly to the maxillary; each mandible serrate along its entire length with fine, saw-toothed odontoids, with a much enlarged odontoid at the tip of each ramus. No parasphenoid teeth. Moderate-sized, rounded choanae lie in the triangle between the vomerine and palatine teeth. Tongue about half as wide as mouth opening, pear-shaped, its posterior border not free and not notched. Snout arrow-head shaped, terminating in a 4-millimeter proboscis, fleshy, rather flat and pointed in profile, the upper jaw extending two millimeters (exclusive of proboscis) beyond lower; nostrils more superior than lateral, not projecting, their distance from end of snout about equal to that from eye, separated from each other by an interval equal to about one-half their distance from eye. Canthus rostralis sharply defined but low; loreal region very slightly concave and very oblique, the upper lip flaring out strongly below it. Eye small, not prominent, its diameter equal to its distance from nostril; interorbital distance more than twice the width of upper eyelid (exclusive of superciliary appendage), which is slightly greater than distance between nostrils. Upper eyelid with a fleshy superciliary appendage four millimeters long. Palpebral membrane not reticulate. Tympanum very distinct, twice as high as wide, its long diameter about equal to diameter of eye, separated from eye by a distance nearly equal to its long diameter. Fingers with a trace of web at base, fourth finger considerably longer than second, reaching to disk of third, which is not so wide as the narrow width of the tympanum; no projecting rudiment of a pollex; ulnar ridge well developed. Toes about one-fourth webbed, the web on fourth toe reaching the middle of the preantepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering an area about one-half the diameter of disk of third finger; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a well-developed tarsal ridge; a dermal appendage on heel. Body not elongate, in postaxillary region much narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap considerably. No patagium. Skin of upper parts very finely granular, but the projecting neural spines of the dorsal vertebrae give the appearance of a median row of well-developed warts on the back. The lateral margin of postorbital process of helmet makes a shelf above the tympanum; skin of throat and chest thin and smooth, that of belly and lower femur very thin and very finely granular; no skinfold across chest; no inguinal gland; no apparent vocal sac. Skin of head not co-ossified with skull, roof of skull exostosed and forming a well-developed casque. The helmet is triangular in shape along the margin of jaws, the canthal ridges curve and meet between the nostrils; above, the helmet terminates posteriorly in two well-developed postorbital spines with a curving posterior margin between them. On the side of the head the helmet behind the eye and between the angle of jaw and the postorbital spine is interrupted only by the tympanum.

Dimensions.—Head and body, 44.4 mm.; head length (exclusive of proboscis), 20.7 mm.; head width, 25.5 mm.; femur, 22.5 mm.; tibia, 25 mm.; heel-to-toe, 36.1 mm.; hand, 16 mm.

Color in alcohol.—A very pale tan frog with a little dark brown along the canthal ridge, a little above and behind the eyes, and above the sacrum and above the tip of the urostyle. There are faint traces of several narrow, darker stripes above the legs.

Remarks.—The described specimen was the only one examined.

Cerathyla johnsoni **Noble**

PLATE 23C–E

1917. *Cerathyla johnsoni* Noble, p. 798, pl. 37 (type locality, Colombia, Antioquia, 14 mi. north of Mesopotamia, Santa Rita Creek); 1926a, p. 18.—Dunn, 1944c, p. 517.

1945. *Cerathyla bubalis.*—Myers and Carvalho, 1945, p. 21.—Gorham, 1963, p. 21.

Diagnosis.—A *Cerathyla* with short (about 2 mm.) proboscis and superciliary processes and with the tympanum separated from the eye by a distance about equal the width of the tympanum.

From *C. proboscidea,* the only other member of the genus now known from Colombia, it can be distinguished by the shorter proboscis and superciliary processes (2 mm. instead of 4 mm.) and by having its tympanum separated from the eye by a distance equal to its width rather than its height.

Description.—CNHM 63850, from eight kilometers south of Valdivia, Antioquia, Colombia. Vomerine teeth in a pronounced V-shaped structure, anterior teeth in both rami of the V are enlarged into a definite patch, palatine teeth in two well-developed series nearly in contact medially and passing laterally nearly to the maxillary; each mandible serrate along its entire length with fine, saw-tooth odontoids with a much enlarged odontoid at the tip of each ramus.

No parasphenoid teeth. Moderate-sized, somewhat ovate choanae lying in the triangle between the vomerine and palatine teeth. Tongue about one-third as wide as mouth opening, rounded, its posterior border fused and unnotched. Snout arrow-head shaped, terminating in a small fleshy proboscis about two millimeters in length, rather flat and pointed in profile, the upper jaw extending about two millimeters (exclusive of proboscis) beyond lower; a short, fleshy appendage at the base of each jaw; nostrils more superior than lateral, somewhat projecting, their distance from end of snout about equal that from eye, separated from each other by an interval equal to about one-half their distance from eye. Canthus rostralis sharply defined but low; loreal region very slightly concave and very oblique, the upper lip flaring out strongly below it. Eye small, not prominent, its diameter equal to its distance from nostril; interorbital distance equal to about twice the width of upper eyelid, which is slightly greater than distance between nostrils. Upper eyelid with a fleshy superciliary appendage about one millimeter long. Palpebral membrane not reticulate. Tympanum very distinct, nearly twice as high as wide, its long diameter one-third again as great as diameter of eye, separated from eye by a distance nearly equal to its width. Fingers with but a trace of web at base, fourth finger considerably longer than second, reaching to disk of third, which is not so wide as the narrow width of the tympanum; no projecting rudiment of a pollex; ulnar ridge well developed. Toes about one-fourth webbed, the web on fourth toe reaching the middle of the preantepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering an area about one-half the diameter of disk of third finger; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a well-developed tarsal ridge; a well-developed dermal appendage on heel and another on knee. Body not elongate, in postaxillary region much narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee reaches to axilla; when legs are bent at right angles to body, heels overlap considerably. No patagium present. Skin of upper parts very finely granular, but the projecting neural spines of dorsal vertebrae give the appearance of a median row of well-developed warts on the back. The lateral margin of postorbital process of helmet makes a shelf above the tympanum. Skin of throat and chest thin and smooth, that of belly and lower femur very thin and very finely granular; no skinfold across chest; no inguinal gland; no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull exostosed and forming a well-developed casque. Helmet triangular in shape along margin of the jaws, canthal ridges curve and meet between the nostrils; above, the helmet terminates posteriorly in two well-developed postorbital spines with a curving posterior margin between them. On the side of the head, the helmet behind the eye and between the angle of the jaw and the postorbital spine is interrupted only by the tympanum.

Dimensions.—Head and body 45.5 mm.; head length 22.4 mm. (exclusive of proboscis); head width, 23.3 mm.; femur, 23.6 mm.; tibia, 26.5 mm.; heel-to-toe, 34.7 mm.; hand, 15.6 mm.

Color in alcohol.—A very pale tan frog with a darker brown triangular area on the back just posterior to helmet, the skin above the tips of neural spines dark brown, a small brown spot above the middle of urostyle, a dark triangular area below vent, and chin, throat, and chest dark chocolate brown. The brown on the chest extends onto the *undersurface* of upper arm and then crosses as a band across the upper surface of forearm. The margins of both upper and lower lips are mottled with dark brown. Three narrow, rather pale, brown crossbands occur on upper surface of each thigh, shank, and foot. Dorsal surfaces of fingers are rich chocolate brown in contrast to the pale dorsal surface of the hand.

Remarks.—We cannot follow Myers and Carvalho in synonymizing this form with *C. bubalis.* We strongly suspect that time and material will demonstrate rather extensive geographic variation in this group and that many of the nominal forms will prove to be geographic races of one or two widespread polytypic species.

Specimens Examined

COLOMBIA

ANTIOQUIA: Santa Rita Creek, 14 mi. north of Mesopotamia, AMNH 1341 (type), 1342–3 (photographs); eight km. south of Valdivia, CNHM 63850.

Genus *Cryptobatrachus* Ruthven

1916. *Cryptobatrachus* Ruthven, 1916b, p. 1, (type species, *Cryptobatrachus boulengeri* Ruthven).

Generic diagnosis.—Vomerine teeth in two nearly straight transverse series, which nearly touch on the midline and which lie behind the rounded choanae; sacral diapophyses nearly rounded; female carries the eggs on her back; eggs hatch directly into frogs; a single subgular vocal pouch in the male.

Key to Colombian Species of *Cryptobatrachus*

a^1. Without distinct pale light spots on dorsum and with thighs dark with light blotches.

b^1. Distance from anterior corner of eyelid to naris distinctly less than distance from anterior to posterior corner of eyelid; dorsum rough and dorsolateral folds fairly distinct . . . . **C. fuhrmanni**

b^2. Distance from anterior corner of eyelid to naris about equal to that from anterior to posterior corners of eyelid; dorsum fairly smooth and dorsolateral folds not so distinct . . . . **C. boulengeri**

a^2. With distinct pale light spots on the dorsum and both pale thighs marked with three or four distinct dark crossbands . . . . **C. nicefori**

Cryptobatrachus nicefori, new species

FIGURE 7

Holotype.—MLS 138, an adult(?) female collected at La Salina, Boyacá, Colombia, by Hno. Nicéforo María.

Diagnosis.—A *Cryptobatrachus* with thin, *Hyla*-like thighs conspicuously marked with three or four distinct, broad, black crossbands, and with distinct pale (yellow in preservative) scattered light spots on the dorsum.

This new species may be distinguished at a glance from both *C. boulengeri* and *C. fuhrmanni* by the thin thighs and by the striking pattern on thighs and dorsum.

Description of holotype.—Vomerine teeth in two long, transverse series, lying close together behind the posterior borders of the moderate-sized, somewhat ovate choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border fused and

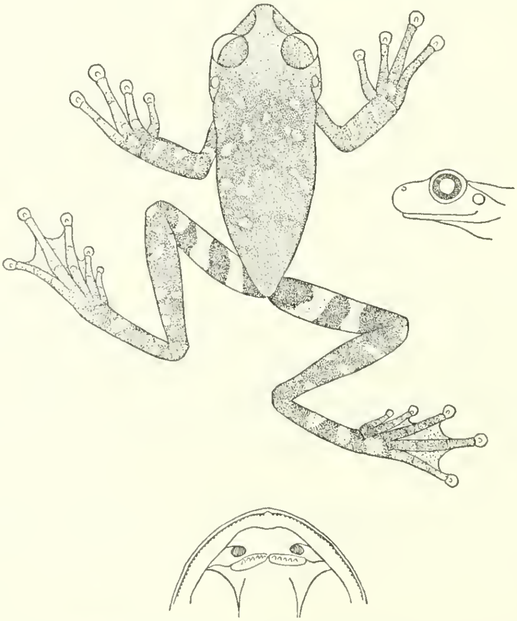

FIGURE 7.—*Cryptobatrachus nicefori*, holotype, MLS 138 (same size, except mouth parts, which are × 2).

not notched. Snout moderate, somewhat triangular when viewed from above, slightly rounded in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye; distance from nostril to anterior corner of eye about equal to distance from anterior to posterior corners of eye. Canthus rostralis well defined; loreal region slightly concave and nearly vertical, the upper lip flaring out but very slightly below it. Eye moderate, protruding, prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance as great as width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers with a trace of web between second and third and between third and fourth, fourth finger about one-half disk longer than second, reaching to disk of third, which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching to base of the antepenultimate phalanx, third toe slightly longer than fifth, disk of fourth covering about two-thirds the tympanic area; a distinct oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; a wart-like dermal appendage on heel. Body moderately elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches eye; when limbs are laid along the side, knee and elbow just meet; when hind legs are bent at right angles to body, heels overlap greatly; thighs thin and *Hyla*-like. No patagium. Skin of upper parts smooth; no structural dorsolateral folds evident; a rather narrow glandular ridge passing above tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; no apparent traces of a skinfold across chest; adult(?) female, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 39.3 mm.; head length, 14.6 mm.; head width, 14 mm.; femur, 17.3 mm.; tibia, 21.1 mm.; heel-to-toe, 29.4 mm.; hand, 13.4 mm.

Color in alcohol.—Dorsum dark gray with scattered, distinct, more or less rounded yellow spots. These spots range from one-half to two-thirds the diameter of tympanum. Between axilla and groin are a series of rather distinct—in some cases nearly vertical—black blotches. Each thigh is crossed by three distinct, broad, black bands which extend down onto the anterior and posterior faces of the thigh but which fail to meet on the undersurface of the thigh. Paler but somewhat similar crossbands are on the dorsal surfaces of the shanks and arms. The specimen is rather dark below.

Remarks.—At first glance, the thigh pattern of this species makes one think of *Hyla boulengeri;* in fact, this species has a more *Hyla*-like mien than has either *C. boulengeri* or *C. fuhrmanni.*

The vomerine teeth and the more or less cylindrical sacral diapophyses convinced us that this new species should be described as a *Cryptobatrachus.* The life history is completely unknown.

The holotype, which is in the collection of the Museo del Instituto de La Salle, may well be the same specimen on which Dunn (1943, p. 311) based his statement that there was an undescribed species of *Cryptobatrachus* in northern Colombia.

The holotype was the only specimen examined.

***Cryptobatrachus fuhrmanni* (Peracca)**

FIGURE 8

1914. *Hyla fuhrmanni* Peracca, p. 108 (type locality, Colombia, Guaca [=Heliconia, Antioquia], 1,600 m.).

1917. *Hyloscirtus fuhrmanni.*—Noble, 1917, p. 805.—Dunn, 1943, p. 310.

1926. *Cryptobatrachus incertus* Barbour, p. 193 (type locality, Colombia, Antioquia, Sonsón).—Barbour and Loveridge, 1929, p. 245.—Liu, 1935, p. 33.—Goin, 1961, p. 8.—Gorham, 1963, p. 21.

1944. *Cryptobatrachus fuhrmanni.*—Dunn, 1944c, p. 517 [1957, p. 91].

Diagnosis.—A *Cryptobatrachus* with thick thighs that are rather dark posteriorly.

This species may be distinguished from *C. nicefori* by the lack of distinct *dark* crossbands on the thighs and distinct light spots on the back. From *C. boulengeri* it may be distinguished by its having a rougher, wartier skin, generally darker color both above and below, more distinct folds along the dorsolateral region, and the distance from the anterior corner of the eyelid to the naris distinctly less than the distance between the anterior and posterior corners of the eyelids.

Description.—MCZ 11616 (type of *incertus*) from Sonsón, Antioquia, Colombia. Vomerine teeth in two short, heavy, transverse series lying close together (but with a distinct gap) on a level with the posterior borders of the choanae; tongue narrow, about half as wide as mouth opening, its posterior border fused and without a distinct notch. Snout moderate, broadly ovate when viewed from above, slightly projecting when viewed in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis well defined; loreal region concave and somewhat oblique; the upper lip flaring out slightly below it. Eye moderate, very prominent, its diameter equal to its distance from nostril; interorbital distance about one-half the width of upper eyelid, which is about equal to distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by about one-half its own diameter. Fingers entirely free, fourth finger considerably longer than second, reaching to middle of disk of third which slightly more than covers the tympanic area; no rudiment of a pollex. Toes slightly more than one-half webbed, web to base of disk of second and fourth toes, third and fifth toes subequal, disk of fourth toe covering the tympanic area; a distinct oval inner and a smaller, less-distinct, rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region but little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond naris; when limbs are laid along the side, knee and elbow considerably overlap, the knee reaching the axilla; when hind legs are bent at right angles to body, heels slightly overlap. No patagium. Skin of upper parts glandular, with prominent, elongate, wart-like tubercles arising from various areas in which the glandules of the skin appear particularly concentrated, these tubercles particularly conspicuous around the tympanum and at the bases of

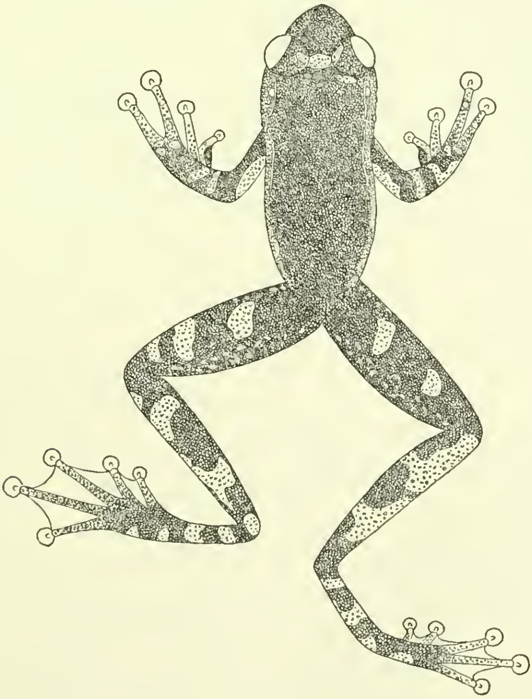

Figure 8.—*Cryptobatrachus fuhrmanni*, CNHM 63892 (same size).

the jaw. A distinct row of tubercles from behind the eye, above the tympanum to above the axilla. Another row beginning above the axilla and extending posteriorly to between the sacrum and coccyx, thus forming a sort of dorsolateral fold; a few less well-developed tubercles on upper surfaces of arm; skin of throat, chest, belly, and lower femur uniformly and very finely granular; no skinfold across chest; vocal sac not apparent.

Dimensions.—Head and body, 46.6 mm.; head length, 17 mm.; head width, 17.3 mm.; femur, 27.7 mm.; tibia, 28.9 mm.; foot, 36.7 mm.; hand, 16.4 mm.

Color in alcohol.—A very dark frog. Entire dorsum, top of head, and upper surfaces of limbs a chocolate brown; under magnification this brown can be seen to be mottled faintly with an even darker brown. Undersurfaces of chin, throat, and belly a pale brown with the undersurfaces of the thighs a mottling of the dorsal and ventral ground colors. Upper lip dark with four vertical bars of a lighter hue; two of the bars enter the eye.

Variation.—There are too few specimens available to make an adequate study of variation, but from those that are available it appears that *C. fuhrmanni* is a rather uniform species. All the male specimens are rather dark and rather rough, with fairly well-developed folds along the dorsolateral region.

A large female (CNHM 82025, with the data "Colombia") seems to represent this form. This frog, measuring 60.7 millimeters in head and body length, was carrying eggs when captured. One of the eggs still with this female contains an embryo with pigment and well-developed eyes. There are 24 egg pockets in the skin on her back. The pattern on the rear of her thighs is paler than in the examined males of this form, but her short snout and the roughness on the top of her head seem to indicate that this female should be identified as *fuhrmanni* rather than *boulengeri* or *nicefori*.

Remarks.—The name "*fuhrmanni*" has had a somewhat checkered history. Peracca (1914, p. 108) described the frog in the genus *Hyla*. Noble (1917, pp. 804, 805), surely without ever having seen a *Hyloscirtus*, assigned *Cryptobatrachus boulengeri* (which had been described by Ruthven in 1916) to the genus *Hyloscirtus*, along with *Hyla fuhrmanni* of Peracca. Since we have now seen recent material of the adults of both sexes and the young of *Hyloscirtus*, as well as all three species of *Cryptobatrachus*, we can categorically state that the two genera are distinct and that *Hyloscirtus* has nothing to do with the problem under discussion. Ruthven (1922, p. 551) took issue with Noble about assigning *Cryptobatrachus* to *Hyloscirtus* but he assigned his own species, *boulengeri*, to the synonymy of *fuhrmanni*. Barbour

(1926, p. 193), apparently without checking type localities, described *Cryptobatrachus incertus* from Sonsón in Antioquia.

Three distinct populations of *Cryptobatrachus* are now known from Colombia. One is from the Sierra Nevada de Santa Marta in Magdalena, for which the name *boulengeri* Ruthven (type locality, San Lorenzo) is available. Another is in the Cordillera Central of the Andes of northern Colombia in the state of Antioquia, and for it two names are available: *fuhrmanni* Peracca with the type locality "Guaca" (now known as Heliconia), about 18 kilometers southwest of Medellín; and *incertus* Barbour, with the type locality Sonsón, about 70 kilometers south-southeast of Medellín. Peracca's name antedates Barbour's by twelve years. The third population is in the northern end of the Cordillera Oriental of the Andes of northern Colombia in the states of Santander and Boyacá; for that population we herein propose the name *nicefori*.

Dunn (1943, p. 311) indicated that there was an undescribed *Cryptobatrachus* in northern Colombia, and he (Dunn, 1944c, p. 517) pointed out correctly, apparently for the first time, that the name *Cryptobatrachus fuhrmanni* applied to the population in the Cordillera Central and the name *Cryptobatrachus boulengeri* applied to the one in the Sierra Nevada de Santa Marta.

The specimens (MZUM 74812 and MLS 202) listed under *C. boulengeri* from San Gil in Santander are the only ones of that species recorded from outside the Santa Marta Mountains. They certainly are not identical with *nicefori* of adjacent Boyacá, and the data, if correct, would seem to indicate that *boulengeri* probably occurs that throughout the little-collected Sierra de Perijá and Sierra de Ocaña form the northern extension of the Oriental Andes.

Specimens Examined

COLOMBIA

Antioquia: Jericó, MCZ 24887; Sonsón, MCZ 11616 (type), 16266; Bellavista, above Río Porce, CNHM 63892.
No precise locality: CNHM 82025.

Cryptobatrachus boulengeri **Ruthven**

Plate 24a–c

1916. *Cryptobatrachus boulengeri* Ruthven, 1916b, p. 2, 1 pl. (type locality, San Lorenzo, Magdalena, Colombia).—Barbour and Loveridge, 1929, p. 245.—Dunn, 1944c, p. 517.—J. Peters, 1952, p. 12 — Goin, 1961, p. 8.
1916. *Hyla fuhrmanni.*—Ruthven, 1916b, p. 1.
1917. *Hyloscirtus boulengeri.*—Noble, 1917, p. 805.
1922. *Cryptobatrachus fuhrmanni.*—Ruthven, 1922, p. 55.—Hellmich, 1939, p. 538.—Gorham, 1963, p. 21.

Diagnosis.—A *Cryprobatrachus* with thick thighs that are faintly mottled posteriorly.

This species may be distinguished from *C. nicefori* by the lack of very distinct crossbands on the thighs and light spots on the back. From *C. fuhrmanni* it may be distinguished by its smoother skin, by being generally paler, both above and below, by having much less distinct dorsolateral folds, and by having the distance from the anterior corner of the eyelid to the naris about equal the distance between the anterior and posterior corners of the eyelid.

Description.—MZUM 48530 (holotype), from San Lorenzo, Magdalena, Colombia. Vomerine teeth in two short, transverse series lying close together on a level with the posterior borders of the small, rounded choanae; tongue half as wide as mouth opening, broadly cordiform, its posterior border very slightly free and very shallowly notched. Snout moderate, broadly triangular when viewed from above, rounded in profile, the snout extending slightly beyond lower jaw; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half their distance from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis fairly well defined; loreal region slightly concave and somewhat oblique, the upper lip flaring out moderately below it. Eye moderate, not particularly prominent, its diameter one-fourth greater than its distance from nostril; interorbital distance about equal to width of upper eyelid, which is relatively wide and about equal to the distance between nostrils. Tympanum very distinct, about one-fourth the diameter of eye, separated from eye by a distance equal to about one-half its own diameter. Fingers without webs at base, fourth finger considerably longer than second, just reaching to middle of disk of third, which snugly covers the tympanic area; no projecting rudiment of a pollex. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee reaches into axilla; when hind legs are bent at right angles to body, heels just touch. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower femur uniformly and very finely granular; traces of a skinfold across the chest; no inguinal gland; vocal sac not apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 33.1 mm.; head length, 12.3 mm.; head width, 12.7 mm.; femur, 19.7 mm.; tibia, 19.8 mm.; foot, 25.3 mm.; hand, 10 mm.

Color in alcohol.—This specimen is now a warm medium brown above and a dirty, yellowish brown below without a trace of pattern.

Variation.—A series of fresh specimens from the Río Minca in the Sierra Nevada de Santa Marta, collected by Fred Medem, permits a little better understanding of the pattern variation in this species than we have had heretofore. In each of the fresh specimens, one of the most conspicuous pattern elements is a broad dark band between the eyes bordered with a very pale narrow margin. In some of the specimens, this band has a straight margin anteriorly and a v-shaped margin posteriorly so that the interocular bar has the form of an inverted triangle. A similar sort of light-bordered, dark band extends downward and slightly anteriorly from each eye to the margin of the upper lip, and another dark band extends from the eye backward through the tympanum. However, the ventral margin, but not the dorsal margin, of the latter band is bordered by white. The crossbands on the hind legs seem to be more distinct than they are in C. *fuhrmanni* (though not so marked as they are in C. *nicefori*), but this may be due to the fact that the specimens of *boulengeri* are fresher than those of *fuhrmanni*. Ventrally, these specimens are dark gray on the chin becoming lighter posteriorly, while the undersurfaces of the thighs and, to a lesser extent, the posterior portion of the belly and the undersurfaces of the shanks and arms are bright yellow.

Structurally, the specimens of *boulengeri* seem to have a relatively shorter, broader body, whereas the specimens of *fuhrmanni* seem to have heavier thighs. No structural differences can be observed in the amount of webbing on the feet.

Specimens Examined

COLOMBIA

Magdalena: Santa Marta Mts., MZUM 47408–9, 48300, BM 1921.1.25.1; San Lorenzo, Santa Marta Mts. MZUM 48530 (holotype), 48614–5, 48617, 54620–1, 54623–6, MCZ 8980, USNM 118734; Cincinnati, Santa Marta Mts., MZUM 48531–5, 48537–8, 54622, 54631–2, 54638; Quebrada, Santa Marta Mts., MZUM 54627–8; Quebrada Hueva Santa, Santa Marta Mts., MZUM 54629; Quebrada Viernes Santo, San Lorenzo, MZUM 54630; Río Minca, on road to San Lorenzo, Santa Marta Mts., CJG 2341–50, 2452–3.

Santander: San Gil, MZUM 74812, MLS 202.

Genus *Gastrotheca* Fitzinger

1843. *Gastrotheca* Fitzinger, p. 30 (type species, *Hyla marsupiata* Duméril and Bibron).

Generic diagnosis.—Medium- to large-size hylids without teeth on the mandible, palatines, or parasphenoid; with a well-defined pouch on the back of the female, opening posteriorly either by a round, puckered aperture or by a longitudinal slit, but the pouch never a slit-like trough as in *Nototheca;* adult male with a rudimentary pouch on the back and a single, unpaired vocal pouch; vomerine teeth in two short series; derm of the head may be co-ossified with the skull or it may be free, in which case the roof of the skull is exostosed.

Key to Colombian Species of *Gastrotheca*

a^1. Superciliary processes forming distinct triangular appendages on the upper eyelids.

b^1. Cranial derm co-ossified with roof of skull; well-developed dermal appendages on heels . . . . **G. bufona**

b^2. Cranial derm not fused with roof of skull; dermal appendages on heels tiny or absent . . . . **G. cornutum**

a^2. Without superciliary processes forming distinct triangular appendages on upper eyelids.

b^1. Cranial derm co-ossified with roof of skull; intersquamosal shelf complete and forming a nearly straight posterior margin to skull.

c^1. Tibia length distinctly more than one-half the distance from snout to tip of urostyle . . . . **G. nicefori**

c^2. Tibia length not more than one-half the distance from snout to tip of urostyle . . . . **G. medemi**

b^2. Cranial derm free from skull; intersquamosal shelf absent or incomplete but not forming a nearly straight margin at back of skull.

c^1. Dorsal pattern bright and conspicuous.

d^1. Dorsum dark with numerous, small, rounded light spots **G. aureomaculatus**

d^2. Dorsum pale with a very conspicuous dark mid-dorsal stripe **G. helenae**

c^2. Dorsal pattern somber or plain.

d^1. Size large (males 60–70 mm., females 70+ mm.) and belly not generally mottled . . . . **G. mertensi**

d^2. Size smaller (generally less than 60 mm.) and belly generally somewhat mottled . . . . **G. monticola argenteovirens**

***Gastrotheca bufona*, new species**

FIGURE 9

Holotype.—MLS 344, an adult male from Ventanas (about 50 kilometers [by road] northwest of Yarumal) Antioquia, Colombia, collected by Hno. Nicéforo María in 1963.

Diagnosis.—A *Gastrotheca* with the upper eyelids bearing triangular fleshy appendages, with dermal appendages on the heels, and with the derm of the head co-ossified with the skull.

This new species can be distinguished at a glance from all Colombian *Gastrotheca* except *cornutum* by the well-developed superciliary dermal process. It differs from *cornutum* in having the derm of the head co-ossified with the skull.

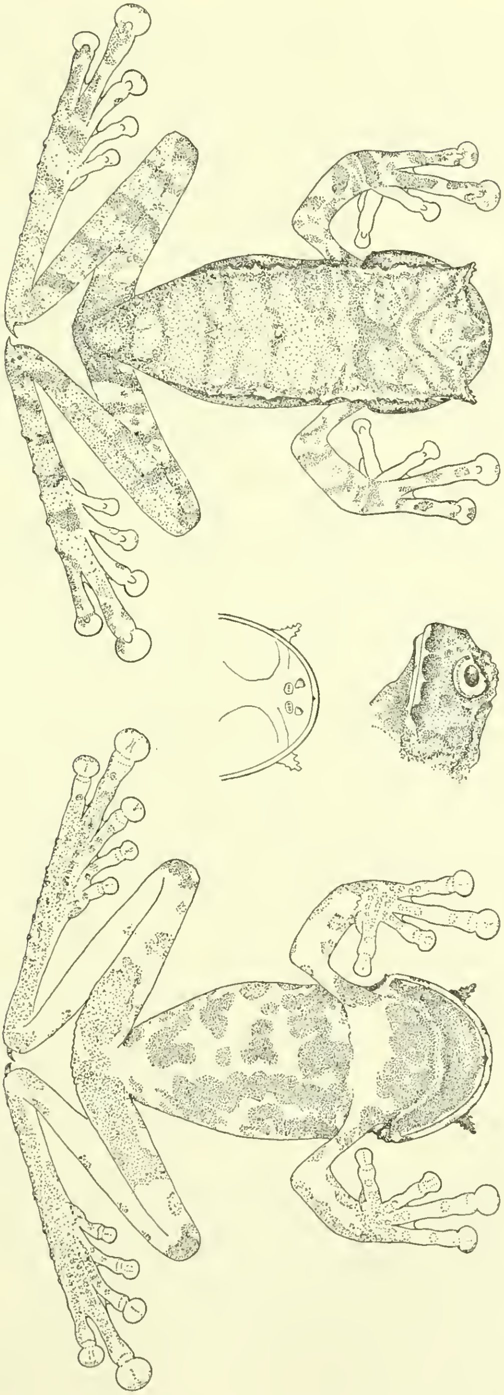

Figure 9.—*Gastrotheca bufona*, holotype, MLS 344 (same size).

Description of holotype.—Vomerine teeth in two rounded patches, lying close together between the posterior borders of the small, rounded choanae; tongue two-fifths as wide as mouth opening, rounded, its posterior border free and unnotched, Snout moderate, rounded when viewed from above, truncate in profile, the upper jaw extending hardly at all beyond lower; nostrils lateral, not projecting, their distance from tip of upper jaw about equal that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region concave and nearly vertical. Eye moderate, not prominent, its diameter one-third again as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid at its base. Upper eyelid developed into an elongate, warty, pointed superciliary process. Tympanum distinct but inconspicuous, its long diameter about one-half the diameter of eye, separated from eye by a distance nearly equal to its own long diameter. Fingers unwebbed, fourth finger considerably longer than second, reaching to middle of disk of third, which is twice the size of the tympanic area; no projecting rudiment of a pollex; a low but distinct, warty ulnar ridge. Toes webbed at base between third and fourth and fourth and fifth, web not quite reaching base of antepenultimate phalanx of fourth toe. Third toe distinctly shorter than fifth, disk of fourth half again as large as the tympanic area; a distinct but minute oval inner metatarsal tubercle; no distinct outer tubercle, no distinct tarsal ridge; a well-developed, elongate dermal appendage on heel. Body somewhat elongate for a *Gastrotheca*, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches slightly beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts coarse and glandular. Upper eyelids bearing triangular, warty, "horns"; the dorsolateral folds well developed anteriorly and bearing white, triangular, fleshy projections. A bony ridge passes from behind the eye above the tympanum to the point of origin of the soft dorsolateral fold. Skin of throat, chest, belly, and lower surface of thigh uniformly granular, no trace of a skinfold across chest. Adult male, no vocal sac apparent externally. Without a flat, bony intersquamosal plate forming a transverse, nearly straight margin at the back of the skull. Skin of head co-ossified with skull, roof of skull exostosed.

Dimensions.—Head and body, 55.3 mm.; head length, 20.0 mm.; head width, 25.5 mm.; femur, 31.8 mm.; tibia, 37.3 mm.: heel-to-toe, 51.2 mm.; hand, 23.6 mm.

Color in alcohol.—A gaudy frog with a bright pattern on a ground color of tannish brown. Sides and top of head and loreal region with scattered, distinct, rounded black dots. Larger, rounded, black spots in a row along the margin of the upper jaw; margin of upper jaw between these spots nearly white. Transverse bands of dark brown cross the dorsum from the back of the head to hind end of the body, these dark bands being rather conspicuous on a ground color of light brown. Dorsolateral folds nearly black but the tiny, triangular fleshy processes they bear are nearly white. Distinct bands of dark pigment on a lighter ground color cross the dorsal surfaces of the arms and hands and the legs and feet. The margin of the lower lip is white but the chin and underside of the throat are coal black. The chest and belly and the underside of the arms and legs are yellowish and heavily mottled with dark brown and black areas.

Remarks.—This remarkably distinct species is known from the single specimen collected by Hno. Nicéforo María at Ventanas. Superficially the holotype looks more like *G. ceratophrys* of Panama than any other form, but it differs from that species in having dermal appendages on the heels, in having the skin of the cranium co-ossified with the skull, and in having well-developed dorsolateral folds that bear tiny, triangular dermal appendages.

This is another of the many new species of frogs from Colombia for which our science is indebted to our good friend Hermano Nicéforo María.

The specific name is from the Spanish "bufón," a jester or clown, in reference to the frog's gaudy appearance.

***Gastrotheca cornutum* (Boulenger)**

FIGURE 10

1898. *Nototrema cornutum* Boulenger, 1898a, p. 124 (type locality, Ecuador, Cachabé).—Gadow, 1901, p. 188.—Peracca, 1904, p. 40.—Nieden, 1923, p. 321.
1963. *Gastrotheca cornutum.*—Gorham, 1963, p. 21.

Diagnosis.—A *Gastrotheca* with superciliary processes but with dermal appendage on heel reduced or absent. The cranial derm is not fused to the skull.

This species differs from all Colombian *Gastrotheca* except *bufona* in having well-developed triangular processes growing out of the upper eyelids. It differs from *bufona* in the reduced dermal appendages on the heels and in having the cranial derm free from the skull.

Description.—CNHM 54718, from Río San Joaquin, 1,500 meters, Pacific side, Cauca, Colombia. Vomerine teeth in two small, oval series lying close together between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly ovate, its posterior border not free and not notched. Snout short, ovate when viewed from above, sloping in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region concave and very oblique, the upper lip flaring out below it. Eye moderate, prominent, its diameter equal to its distance from nostril; interorbital distance about equal the width of upper eyelid, which is relatively wide, definitely greater than distance between nostrils. Tympanum moderately distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to twice its own diameter. Fingers with a trace of web at base, fourth finger considerably longer than second, reaching to disk of third, which more than covers the tympanic area; an external swelling indicating a rudiment of a pollex. Toes slightly more than one-half webbed, web reaching middle of antepenultimate phalanx of fourth toe, third and fifth toes subequal, disk of fourth toe covering the tympanic area; a distinct oval inner, but no distinct outer, metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate for a *Gastrotheca*, in postaxillary region definitely narrower than greatest width of head;

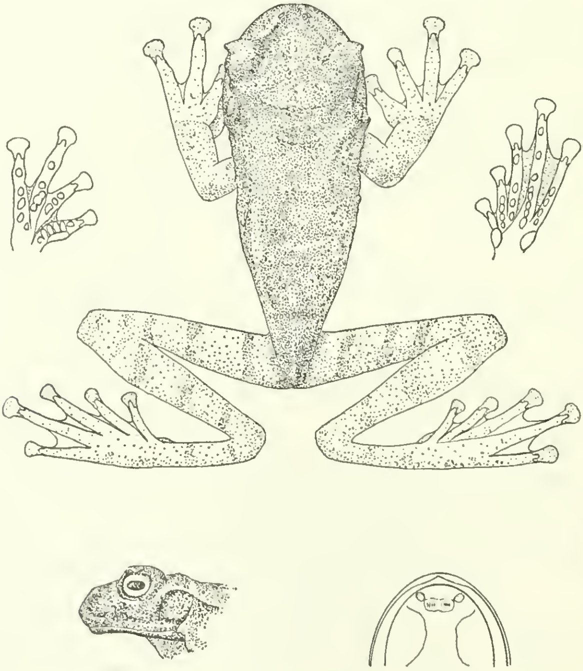

Figure 10.—*Gastrotheca cornutum,* CNHM 63892 (same size).

when hind leg is adpressed, heel reaches well past tip of snout; when limbs are laid along the side, knee extends to axilla; when hind legs are bent at right angles to body, heels considerably overlap. No patagium. Skin of upper parts smooth. There are eight series of tiny, wart-like structures in inconspicuous transverse rows across the back; the first of these rows is between the eyes, the last row just dorsal to the vent. Dorsal skin above lumbar region very flat medially, with raised ridges of skin along each side forming an incipient pouch, as is characteristic of male *Gastrotheca.* There is a spine of skin forming a supraorbital spine projecting outward from each upper lid; skin heavily folded along sides; a rather narrow glandular ridge encircles upper part of tympanum; skin of throat and chest smooth, belly and lower femur uniformly granular; no traces of a skinfold across chest; vocal sac not apparent. Derm of head not fused with cranium but dorsal surface of cranium exostosed; intersquamosal shelf incomplete and not forming a straight posterior margin at the back of the skull.

Dimensions.—Head and body, 58.5 mm.; head length, 17.2 mm.; head width, 19.3 mm.; femur, 27.4 mm.; tibia, 30.2 mm.; foot, 37.7 mm.; hand 12.5 mm.

Color in alcohol.—A dark frog with little discernible pattern. Dorsum a uniform dark brown. Thigh a lighter brown with four narrow dark brown crossbands. Indistinct black dots present on the folded skin along the sides. Indistinct but discernible dark blotches on the upper lip. Entire ventral surface dark but not so dark as the dorsum.

Remarks.—It was with hesitation that we referred this Colombian specimen to the species *G. cornutum.* On direct comparison with the type of *cornutum* (a female), this specimen (a male) differs as follows: in its smaller size (47.6 mm. in head-body length as against 76.2 mm. for the type); in not having the parietal marginal walls nearly so elevated; in having well-developed trace of web between third and fourth toes (absent in the type); in having knee reach to axilla (to elbow in the type); in having seven definite rows of warts transversely across back (absent in the type); and in being in general a more slender frog, although this may be sexual dimorphism. The type has a small but very distinct dermal heel appendage.

There are striking differences in color. The type is a pale frog with tannish yellow dorsal ground color; a dark brown stripe originates at tip of snout, passes upward between the nares, posteriorly between the eyes and parietal ridges, and along the median line of the back to the upper margin of the egg sac opening; another dark stripe originates behind the eye, passes posteriorly above the tympanum and along the side to the lateral margin of the egg sac opening; below this lateral stripe, the color fades into the ventral ground color, which is dirty yellow with darker mottlings. There is a distinct, pale, transverse line above the vent, separating dorsal yellow from gray color of posterior thighs. There are two bright yellow spots below the vent, but these are not definite warts as they are in the Colombian specimen.

The described specimen also was compared directly with the type of *angustifrons*. It is somewhat similar to that species in color, but *angustifrons* lacks the superciliary processes and really seems to be quite distinct. It may well be that after more information becomes available on *cornutum* our specimen will be found to represent a distinct species; until then, *maneat!*

Specimens Examined

COLOMBIA

Cauca: Río San Joaquin, 1,500 m., Pacific side, CNHM 54718.
ECUADOR: Cachabé, BM 98.4.28.162 [1947.2.22.49] (type).
PANAMA: Darién, Tacarcuma village, USNM 141795.

Gastrotheca nicefori Gaige

Figure 11

1933. *Gastrotheca nicefori* Gaige, p. 1 (type locality, Caldas, Pensilvania).—Dunn, 1944b, p. 405.—J. Peters, 1952, p. 15.—Gorham, 1963, p. 21.

Diagnosis.—A large *Gastrotheca* with the derm of the head coossified with the roof of the skull and with the intersquamosal shelf complete and forming a nearly straight transverse margin at the back of the head. It lacks superciliary processes and dermal heel appendages.

This species can be immediately distinguished from all Colombian *Gastrotheca* except *medemi* by having the cranial derm fused to the skull and by having the straight posterior margin to the intersquamosal shelf. From *medemi* it can be distiguished by its broader head and its longer leg (tibia greater than half the distance from snout to tip of urostyle).

Description.—MZUM 73242 (holotype), from Pensilvania, Caldas, Colombia. Vomerine teeth in two short, rather heavy, transverse series lying close together between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border slightly free and shallowly but distinctly notched. Snout moderate, somewhat U-shaped when viewed from above, sloping in profile, the upper jaw not extending considerably beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region slightly concave and but slightly oblique, the upper lip not flaring out strongly below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; interorbital distance about twice the width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to two-thirds its own diameter. Fingers with a trace of web at base, fourth finger considerably longer than second, reaching to middle of disk of third, which slightly more than covers the tympanic area; no projecting rudiment of a pollex. Toes about one-half webbed, the web on fourth toe reaching the proximal one-third of the antepenultimate phalanx, fifth toe about a disk longer than third, disk of fourth just covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little broader than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow meet; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth, a rather narrow, glandular bony ridge passes above

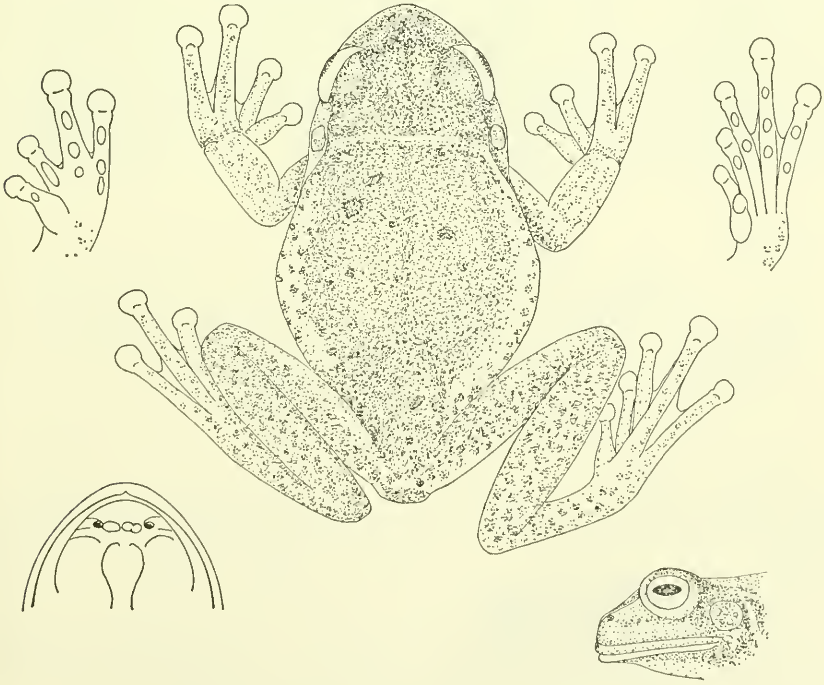

Figure 11.—*Gastrotheca nicefori*, CNHM 63886 (same size).

the tympanum; skin of throat and chest finely granular, that of belly and lower femur uniformly and coarsely granular; a well-developed skinfold across chest; no inguinal gland; adult male, vocal sac not apparent. Skin of head co-ossified with skull, roof of skull exostosed, intersquamosal shelf complete and forming a nearly straight posterior margin to the skull.

Dimensions.—Head and body 65.3 mm.; head length, 23.2 mm.; head width, 25.7 mm.; femur, 31.0±mm.; tibia, 36.4 mm.; foot, 46.4 mm.; hand 18.3 mm.

Color in alcohol.—A light tannish brown above, slightly darker below, particularly the underside of thighs, which are rather dusky.

Variation.—The male is smaller than the female, a typical adult male having a head-body length of 61.3 millimeters, whereas a large female has a head-body length of 82.0 millimeters. All mature females are not this large however, for the type measures only 66 millimeters and another adult female at hand is only 67 millimeters in length. Most of the specimens are rather uniform brown, but one adult female, MLS 343, from Yarumal, is quite dark along the sides and has the dark lateral color separated from the brownish dorsal color by a distinct, narrow stripe posteriorly.

It is with some hesitation that we include USNM 152053, from Sutatenza, here. That specimen has a pattern on the dorsum of scattered dark spots and the head is narrower than typical for *nicefori*. Since its smaller size (head-body 50.0 mm.) may indicate immaturity and since we know nothing of ontogenetic changes in this species, we tentatively assign it on the basis of geography and its well-developed intersquamosal shelf.

Specimens Examined

COLOMBIA

Antioquia: Yarumal, CNHM 63886, MLS 343.
Boyacá: Sutatenza, USNM 152053.
Caldas: Pensilvania, MZUM 73242 (holotype), 71218 (paratype), 92265.
Cundinamarca: Fusagasugá, MLS 208.

***Gastrotheca medemi*, new species**

Figure 12

Holotype.—MZUM 123068, an adult female from Caño Guapáyita, 400 meters, Serranía de La Macarena, Meta, Colombia, collected by F. Medem.

Paratype.—CNHM 81367, Pico Renjifo, 1,500 meters, Serranía de La Macarena, Meta, Colombia.

Diagnosis.—A large *Gastrotheca* with the intersquamosal shelf forming a complete, nearly straight margin at the back of the head and with the cranial derm co-ossified with the roof of the skull.

Gastrotheca medemi probably is most closely related to *G. nicefori*, from which it differs in its narrower head, shorter legs, and smaller tympanum.

Description of holotype.—Vomerine teeth in two short, rounded series, lying between the small, rounded choanae; tongue four-fifths as wide as mouth-opening, broadly rounded, its posterior border slightly free and shallowly notched. Snout moderate, somewhat U-shaped when viewed from above, somewhat rounded in profile for a *Gastrotheca*, the upper jaw extending a little beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about two-fifths that from eye, separated from each other by an interval equal to about three-fifths their distance from eye. Canthus rostralis well defined; loreal region concave and somewhat oblique, the upper lip flaring out below it. Eye moderate, mod-

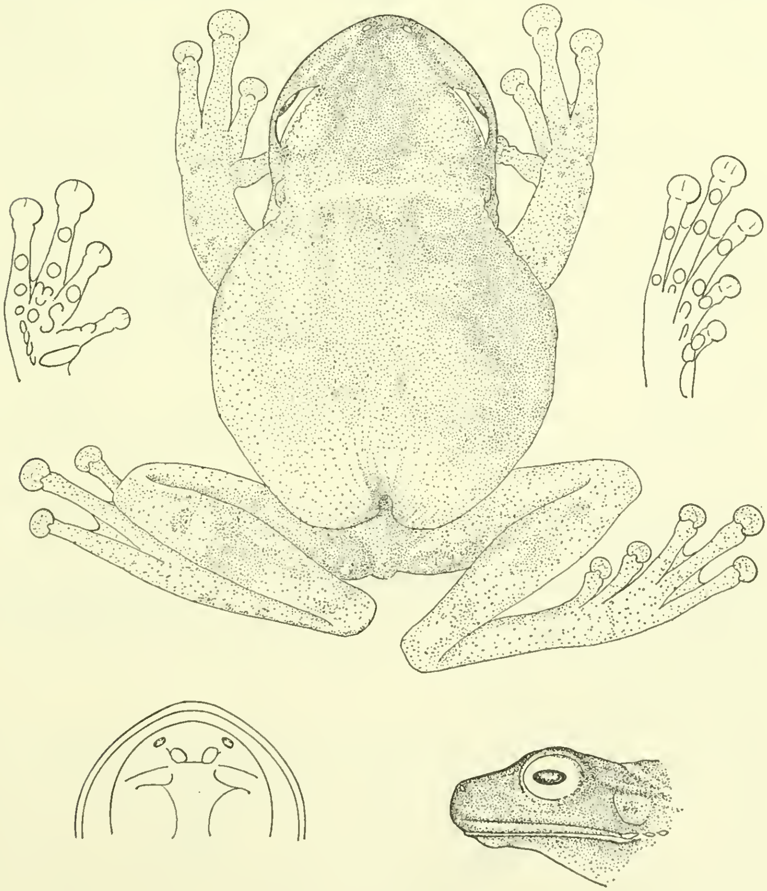

FIGURE 12.—*Gastrotheca medemi*, paratype, CNHM 81367 (same size).

erately prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal to distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance equal to its own diameter, bordered above by a bony shelf. Fingers unwebbed, fourth finger slightly more than a disk longer than second, reaching to disk of third which slightly more than covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-third webbed, the web on fourth toe just reaching the base of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller, indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in post-axillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to anterior margin of eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels meet snugly. No patagium. Skin of upper parts rather smooth. An incipient pouch on the posterior portion of the dorsum. A rather narrow glandular ridge supported by a bony shelf passing above upper part of tympanum. A distinct nuchal dermal fold; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular, a skinfold across chest. Adult male, vocal sac apparently internal. Skin of head co-ossified with skull, roof of skull strongly exostosed. A frontoparietal-squamosal arch which is complete to the rear of the skull.

Dimensions.—Head and body, 62.7 mm.; head length, 22.1 mm.; head width, 23.4 mm.; femur, 27.3 mm.; tibia, 29.2 mm.; heel-to-toe, 43.7 mm.; hand, 21.8 mm.

Color in alcohol.—Pale brown above, cadaverish brown below. Side between axilla and groin moderate brown with a few, indistinct, pale flecks in the brown area just anterior to groin. Anterior and posterior faces of thighs similar in color to the side, the pale flecks being better developed but by no means conspicuous. Underside of chin and throat a little darker than belly.

Remarks.—The paratype is a large female with the following millimeter measurements: head and body, 74.8; head length, 25.2; head width, 29.5; femur, 33.2; tibia, 37.5; heel-to-toe, 54.4; hand, 25.5. Top of head and dorsum are pale brown without any discrete pattern. On each side behind the tympanic region is an area of dark brown that breaks up posteriorly into a series of dark mottlings along the side. Posterior surfaces of thighs are dark brown with mottlings of light tan. Exposed ventral surfaces are brownish gray with the underside of chin being a little darker than the belly.

Gastrotheca helenae Dunn

FIGURE 13

1944. *Gastrotheca helenae* Dunn, 1944b, p. 404 (type locality, Colombia, Norte de Santander, Páramo de Tamá); 1957, p. 44.—Gorham, 1963, p. 21.

Diagnosis.—A *Gastrotheca* with the cranial derm free from the head, without an intersquamosal shelf forming a nearly straight margin at the back of the skull, without dermal appendages on the heels, and without superciliary processes.

This species can be distinguished from all other Colombian *Gastrotheca* except *mertensi* and *aureomaculata* by the above combination of characters. From those two species, and indeed from all *Gastrotheca* known to us. it can be distinguished at a glance by its distinctive pattern.

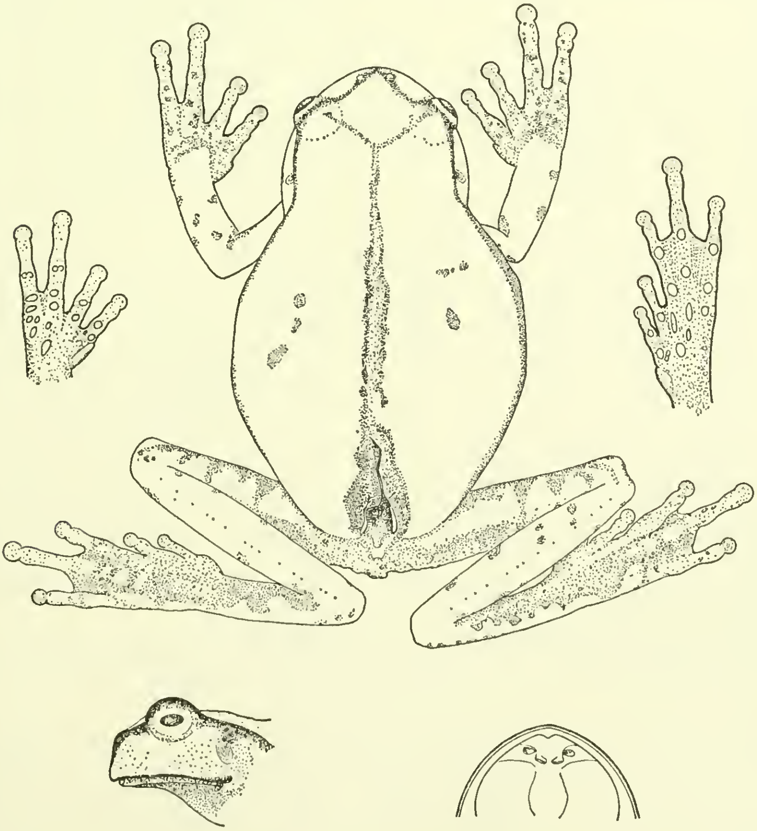

FIGURE 13.—*Gastrotheca helcnae,* holotype, MLS 268 (same size).

Description.—MLS 268 (holotype), from Páramo de Tamá, Norte de Santander, Colombia. Vomerine teeth in two small, oval series lying on a level with the posterior borders of the small, rounded choanae; tongue three-fourths as wide as mouth opening, rounded, its posterior border free and with a short but acute notch. Snout short, rounded when viewed from above, nearly truncate in profile but sloping slightly posteriorly from the vertical; the upper jaw not extending appreciably beyond lower; nostrils more anterior than superior or lateral; not projecting, their distance from end of snout about one-sixth that from eye, separated from each other by an interval equal to about one-third their distance from eye. Canthus rostralis well defined; loreal region nearly flat and nearly vertical, the upper lip not flaring out strongly below it. Eye small, not prominent, its diameter equal to its distance from nostril; interorbital distance slightly more than twice the width of upper eyelid, which is relatively narrow, but slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to twice its own diameter. Fingers entirely free, fourth finger considerably longer than second, reaching to disk of third which covers the tympanic area; a rounded but not spined rudiment of a pollex. Toes slightly less than one-half webbed, web extending to middle of antepenultimate phalanx of fourth; third and fifth toes equal, disk of fourth toe about covering the tympanic area; metatarsal tubercle not distinct; no tarsal ridge; a weakly developed dermal appendage on heel. Body not elongate, in postaxillary region much broader than greatest width of head; when hind leg is adpressed, heel reaches to middle of eye; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap distinctly. No patagium. Skin of upper parts highly smooth. A dorsal pouch present which opens posteriorly by a vertical, slit-like opening. No narrow glandular ridge encircling upper part of tympanum; skin of throat, chest, belly, and lower femur uniformly and very finely granular; no traces of a skinfold across the chest; without a flat, bony intersquamosal plate forming a straight margin at the back of the skull; skin of head not co-ossified with skull but roof of skull exostosed; no vocal sac apparent.

Dimensions.—Head and body, 62.2 mm.; head length, 20.7 mm.; head width, 25.2 mm.; femur, 33 mm.; tibia, 35.1 mm.; foot, 48.5 mm.; hand 21.5 mm.

Color in alcohol.—A handsome frog with a dorsal ground color of cream with the following dark brown dorsal pattern: a fine line from the tip of the snout passing dorsally and forking to pass through each nostril, then posteriorly through the lower margin of the upper eyelid, thence posteriorly above the tympanum to the shoulder region where it merges with the dark brown ventral and lateral color; another pair of fine lines originate on each upper eyelid, pass medially and posteriorly to the middle of the head where they fuse, and continue posteriorly along the midline of the back as a broadening line that posteriorly broadens to completely encompass the opening of the pouch, after which it abruptly terminates. There are a few spots on each side of the middle of the back. There is a fine dark line along the entire margin of the upper lip. A few dark stripes cross, or nearly cross, the top of the thigh; otherwise the tops of the limbs are cream with scattered dark spots; there is a band of brown across each wrist. The entire venter, underside of the limbs, and the sides of the body are a rich chocolate brown.

Color in life.—"Bright yellow with reddish brown and white marks," according to original field notes shown to us by Hno. Nicéforo María.

Note on life history.—Two gray-green (in life) young, about 20 millimeters in head-body length, were "born after capture." They show the same pattern as the parent.

Remarks.—Although Dunn (1944b, p. 404) described this species as having the derm of the head fused with the skull, the head is really quite free. We can offer no suggestions as to the relationship of *helenae.*

The specimens in the series MLS 268 (the type and two juveniles) were the only ones examined.

***Gastrotheca aureomaculata*, new species**

Figures 14–16

Holotype.—CNHM 69701, an adult male, collected in Huila, Colombia, at San Antonio, a small village about 25 kilometers west of San Agustín, at 2,300 meters.

Paratype.—CJG 2307, collected at Moscopán, Cauca, Colombia, by Marte Latham.

Diagnosis.—A *Gastrotheca* without the cranial derm co-ossified with the skull, without superciliary processes, without dermal appendages on the heels, and with the intersquamosal shelf incomplete posteriorly so that it does not form a complete, transverse, straight margin at the back of the head. In preservative it is black with numerous small spots of yellowish white, both above and below. In life the ground color is inky blue but greenish gold spots are so thickly spaced that the frog from a little distance appears bright green.

From the other species of *Gastrotheca* now known from Colombia, this new species can be differentiated from *bufona* and *cornutum* by the absence of superciliary processes; from *nicefori* and *medemi* by having the cranial derm free from the skull; and from *helenae, mertensi,* and *monticola argenteovirens* by having the dorsum and venter thickly covered with light spots.

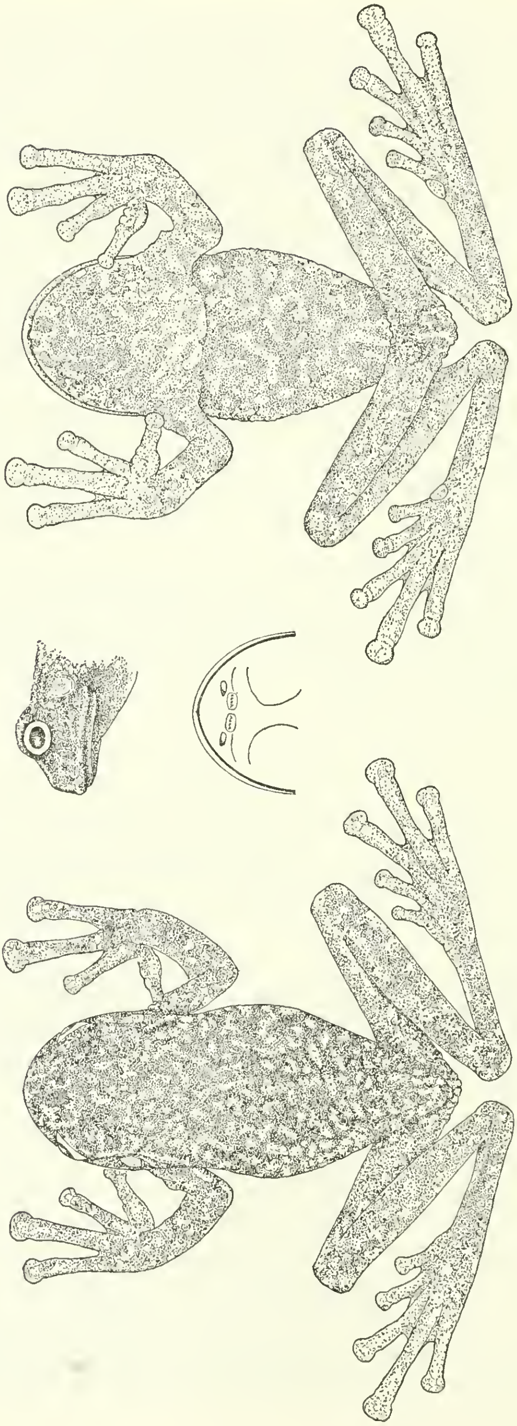

Figure 14.—*Gastrotheca aureomaculata*, holotype, CNHM 69701 (slightly less than same size).

Description of holotype.—Vomerine teeth in two moderately large somewhat transverse series, lying close together on a level with the posterior borders of the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border slightly free and very shallowly notched. Snout not large, rounded when viewed from above, truncate but slightly sloping in profile, the upper jaw extending very little beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region flat and nearly vertical, the upper lip flaring out but slightly below it. Eye neither large nor prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance one-third greater than width of upper eyelid, which is in turn about equal to the distance between nostrils. Tympanum very distinct, about two-thirds the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers with but a trace of web at base, fourth finger considerably longer than second, reaching beyond middle of disk of third which covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes less than one-half webbed, the web on fourth toe reaching the distal end of the preantepenultimate phalanx, third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region nearly equal to greatest width of head; when hind leg is adpressed, heel reaches posterior margin of eye; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts finely granular. An incipient marsupium discernible in supra-urostylic region. A fairly distinct glandular ridge encircling upper part of tympanum; skin of throat and chest finely granular, that of belly and lower surface of thigh uniformly more distinctly so. The granules on the undersurface of the proximal two-thirds of the thigh much finer than those adjacent to them and to those on the belly, thus forming a rather distinctive patch. Skinfold across chest a heavy pectoral fold; adult male, vocal sac not pronounced. Skin of head not co-ossified with skull, roof of skull strongly exostosed.

Dimensions.—Head and body 66.4 mm.; head length, 22.3 mm.; head width, 25.5 mm.; femur, 32.3 mm.; tibia, 36.5 mm.; heel-to-toe, 50.5 mm.; hand. 25.5 mm.

Color in alcohol.—In preservative this is a black frog with extremely numerous small yellowish white spots about one millimeter in diameter scattered over it, above and below. On the belly the spots tend to run together to form vermiculations.

Color of paratype in life.—Dorsal ground color inky blue, top of head and entire back thickly beset with small spots and vermiculate-like marks of a rich greenish gold; spots along side larger and more sparsely spaced so that the ground color is more evident along the side; belly surface silverish gray with thickly set spots and vermiculations of white, these spots larger than those on the dorsal surface; iris bronzy gold, tympanum bright yellow. Dorsal surfaces of arms and legs with the inky blue ground color of the back but with greenish gold spots larger and more sparsely spaced, thus resembling pattern along sides. Concealed surfaces of thighs and axillary regions inky blue with spots more whitish than they are along side of body. Underside of chin and throat bluish green with light and dark specks giving a salt-and-pepper effect. Undersurfaces of hands and feet bluish gray.

Life history.—The live female paratype was carrying eggs in her pouch when she arrived in Gainesville, Florida. The night of April 5 she "gave birth" to approximately 70 tadpoles. The first tadpole metamorphosed May 15. The tadpoles continued to metamorphose until May 17 when the steam heat was inadvertently turned on in the building over the week end. Presumably the temperature became too high for the tadpoles and young, as they all died.

The tadpoles fed avidly on nearly everything offered them. Pieces of meat or gristle, sliced cantaloup, or spinach were all eaten with equal enthusiasm. As soon as the food was put into the aquarium with them, they would gather round it and start eating at any exposed place not preoccupied by other tadpoles.

Description of tadpole.—One of the newly "born" tadpoles has a total length of 25.2 millimeters, of which 9.6 millimeters is head and body. Hind limbs are present, each of which has three weakly developed toe buds. The spiracle is on the left side of the body about half-way between the head and the base of the tail. (See Fig. 15.) The mouth is bordered by fleshy, finger-like projections all around except for about the median third of the dorsal lip. There are two complete rows of teeth dorsally and below the mouth are three rows, the bottom two of which are complete, the uppermost being interrupted in the middle. (See Fig. 16.)

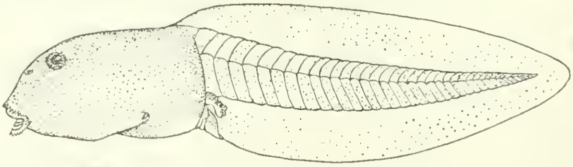

FIGURE 15.—Tadpole, *Gastrotheca aureomaculata* (× 3).

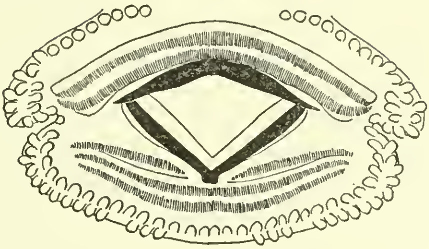

FIGURE 16.—Mouthparts of tadpole, *Gastrotheca aureomaculata.*

A recently transformed individual is 19.4 millimeters in head and body length. It is heavily pigmented but no discernible pattern can be made out in the preserved specimen. The young were bright green in life.

Remarks.—In addition to the type and paratype, a dried, faded female (USNM 152333) received from the National Zoological Park seems to be referable to this species. According to the data that accompanied the specimen, this female was collected at 10 to 15 miles west of Playa de Oro, Chocó, Colombia, by Marte Latham.

Although the holotype came from the state of Huila and the paratype from the state of Cauca, both are really from the same vicinity, as the two localities are in the same mountain range only about 40 kilometers apart.

***Gastrotheca mertensi*, new species**

FIGURE 17

Holotype.—MZUM 121024, an adult female from Moscapán, Cauca, Colombia, collected by Marte Latham, April–May 1957.

Paratypes.—MZVM 121025–30, 121031 (7 young), CJG 2305–6 (alive), USNM 148567–8 (alive), 152334–74 (41 young), all from Moscopán, Cauca, Colombia.

Diagnosis.—A *Gastrotheca* without dermal appendages on heels, without superciliary processes, and with the cranial derm free from the cranium. An intersquamosal shelf is present but incomplete laterally, thus not forming a complete transverse shelf at the rear of the head. In life the male ranges from bronzy to greenish on all exposed dorsal surfaces with a dark, inky blue color on the concealed surfaces of the thighs and under the arms. The female in life is a waxy green on the exposed dorsal surfaces and dark inky blue on the concealed surfaces of the thighs and under the arms. Sometimes the female has the top of the head change to a pale blue. In preservative adults of both sexes are gun metal blue above and dirty gray below.

G. mertensi can be distinguished from all Colombian *Gastrotheca* except *helenae*, *monticola argenteovirens*, and *aureomaculata* by the absence of both superciliary processes and dermal appendages on the heels and by its having the cranial derm free. Its uniform pattern easily distinguishes it from both *helenae* and *aureomaculata*. From *monticola argenteovirens* it differs in its larger size and in the fact that the adults are uniform below rather than mottled.

Description of holotype.—Vomerine teeth in two short, heavy, transverse series, lying close together between the small, rounded choanae; tongue half as wide as mouth opening, longer than wide, its posterior border free and distinctly notched. Snout large, somewhat elongate and triangular for a *Gastrotheca* when viewed from above, truncate and slightly sloping in profile, the upper jaw extending but slightly

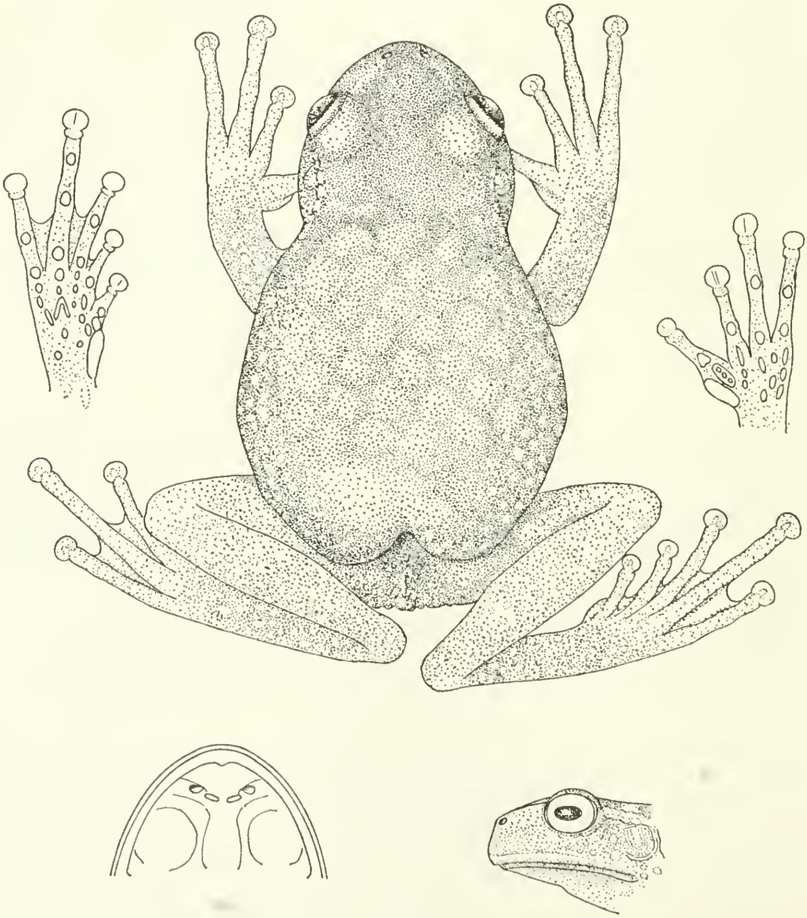

FIGURE 17.—*Gastrotheca mertensi*, holotype, MZUM 121024 (same size).

beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region concave and nearly vertical. Eye neither large nor prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about three-fourths the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers with just a trace of web at base, fourth considerably longer than second, reaching to middle of disk of third which covers about four-fifths the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes about one-third webbed, the web on fourth toe reaching the base of the antepenultimate phalanx, third and fifth subequal, disk of fourth covering about two-thirds the tympanic area; a distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body somewhat elongate, but distorted by having the theca packed with eggs. When hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth but with tile-like pattern due to the eggs in the theca. A rather narrow glandular ridge passes above tympanum; skin of throat and chest, belly, and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult female, no vocal sac. Intersquamosal shelf incomplete laterally, thus not forming a complete transverse shelf at the rear of the head. Skin of head not co-ossified with skull, roof of skull strongly exostosed.

Dimensions.—Head and body, 73.8 mm.; head length, 25.2 mm.; head width, 28.1 mm.; femur, 35.2 mm.; tibia, 39.5 mm.; heel-to-toe, 58 mm.; hand, 28.2 mm.

Color in alcohol.—Gun-metal blue on all dorsal surfaces; ranging from dirty gray to bluish gray on all ventral surfaces. No pattern apparent.

Variation.—There is little variation apparent among the preserved series of adults. The females are somewhat larger (two adult females, 73.8 and 71 mm. in head and body length; three adult males, 64.7, 64.1, and 62.3 mm.) and one of the males has a more mottled belly surface, in this respect approaching the appearance of *G. monticola agenteovirens.*

Color in life.—Male: Very pale bronzy green on top of head, dorsum, top of forearm, hand, shank, and foot; tympanum, top of upper arm, anterior portion of side below the dorsolateral stripe, and iris bright golden bronze; concealed surfaces of thighs, arms, and along sides of body inky blue; underside of chin, throat, and belly bluish gray; and there is some metachrosis, as the dorsal ground color varies from a greenish bronze at times to a clear pale bronze at others. Female: Similar in pattern to the male but the dorsal ground color is a waxy pea green with no trace of bronze, and the top of the head tends toward sky blue rather than bronze; the tympanum and iris bronze, as in the male, but no noticeable bronze along the sides.

Voice.—A living male (in the office of the junior author) calls irregularly during the day and night. The call is made up of two parts—first a series of six to eight snarls followed by a series of four to eight short, explosive, single notes. The snarl is not too unlike that of *Scaphiopus*, and the explosive notes which follow are very similar to a single note of *Rana virgatipes*, although they are not given nearly so rapidly. No pattern was discernible in the time of calling, since he would call in morning, in afternoon, or at night.

Life history.—Two pairs of specimens were sent alive to the senior author in March 1962, by Marte Latham. The gravid female and a male were retained at the U.S. National Museum for observation and the other pair was sent to the junior author in Gainesville, Florida.

The gravid female at the Museum give birth to 96 tadpoles on the weekend of April 6–8. The egg capsules from which the tadpoles emerged were found in the water and measured. While still in the water they ranged from four to five millimeters in diameter. Thirteen of the tadpoles were found dead on Monday morning, April 8. Of those remaining, 43 were kept at the Museum for observation and 40 were sent to the National Zoological Park. The specimens at the Museum started metamorphosing in May; the last one transformed on August 24. When the last specimens of this series were preserved on August 31, 1962, the largest individual had a head-body length of 30.4 millimeters.

When first hatched the tadpoles had a head-body length of about 10 millimeters and a tail length of about 15 millimeters. The body was about 5 millimeters in diameter. On April 9 the tadpoles were observed feeding on *Spirogyra* in the aquarium. On April 12 a piece of pork chop (cooked) was put in the aquarium and they immediately gathered around it and started feeding on it like pigs at a trough.

As the above data indicate, the tadpoles do not all grow at the same rate, metamorphosis occurring in this one lot from about mid-May to August 24.

Remarks.—We believe that *G. mertensi* probably is most closely related to *marsupiata*, but since we do not have first-hand knowledge of all the species of *Gastrotheca* in the Andes south of Colombia we cannot be dogmatic about this. Of the Colombian species of *Gastrotheca*, it is surely most closely related to *monticola argenteovirens*. However, Dr. Robert Mertens compared *mertensi* directly with the type of *monticola argenteovirens*, and both he and his colleague, Dr. Klemmer, state that the two specimens cannot be of the same species. That they are specifically distinct is borne out also by the fact that both forms occur at Moscopán and retain their distinctness there.

All the specimens we have seen have come from Moscopán, in the state of Cauca, Colombia. Moscopán, although an often-cited locality, is not a town or city but a region near the páramos. It is reached by taking the road from Popayán up past Puracé and across the páramo.

Specimens Examined

COLOMBIA

CAUCA: Moscopán, MZUM 121024 (holotype), 121025–30, 121031 (7 juv.), CJG 2305–6, USNM 152334–74 (41 young), 148567–8.

***Gastrotheca monticola argenteovirens* (Boettger)**

FIGURE 18

1892. *Hyla argenteovirens* Boettger, p. 46 (type locality, Colombia, Popayán).—Mertens, 1922, p. 163.

1933. *Gastrotheca marsupiata argenteovirens*.—Mertens, 1933, p. 259.—Vellard, 1957, p. 7.—Gorham, 1963, p. 21.

Diagnosis.—A small *Gastrotheca* without superciliary processes, without dermal appendages on the heel, with the cranial derm free from the skull, and with the intersquamosal shelf incomplete posteriorly so that it does not form a straight margin at the rear of the skull.

This form is more similar to *G. mertensi* than to any other Colombian *Gastrotheca* but it can be distinguished from that species by its small size and by the fact that it tends to be mottled below rather than uniformly colored.

Description.—CNHM 54811, from Guaitarilla, 2,000 meters, Nariño Colombia. Vomerine teeth in two short, rounded, contiguous series, lying between the small, rounded choanae; tongue two-thirds as wide as mouth opening, very broadly cordiform, its posterior border slightly free and shallowly notched. Snout short, rounded when viewed from above, very slightly rounded in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region nearly flat and nearly vertical, the upper lip not flaring out appreciably below it. Eye moderate, not particularly prominent,

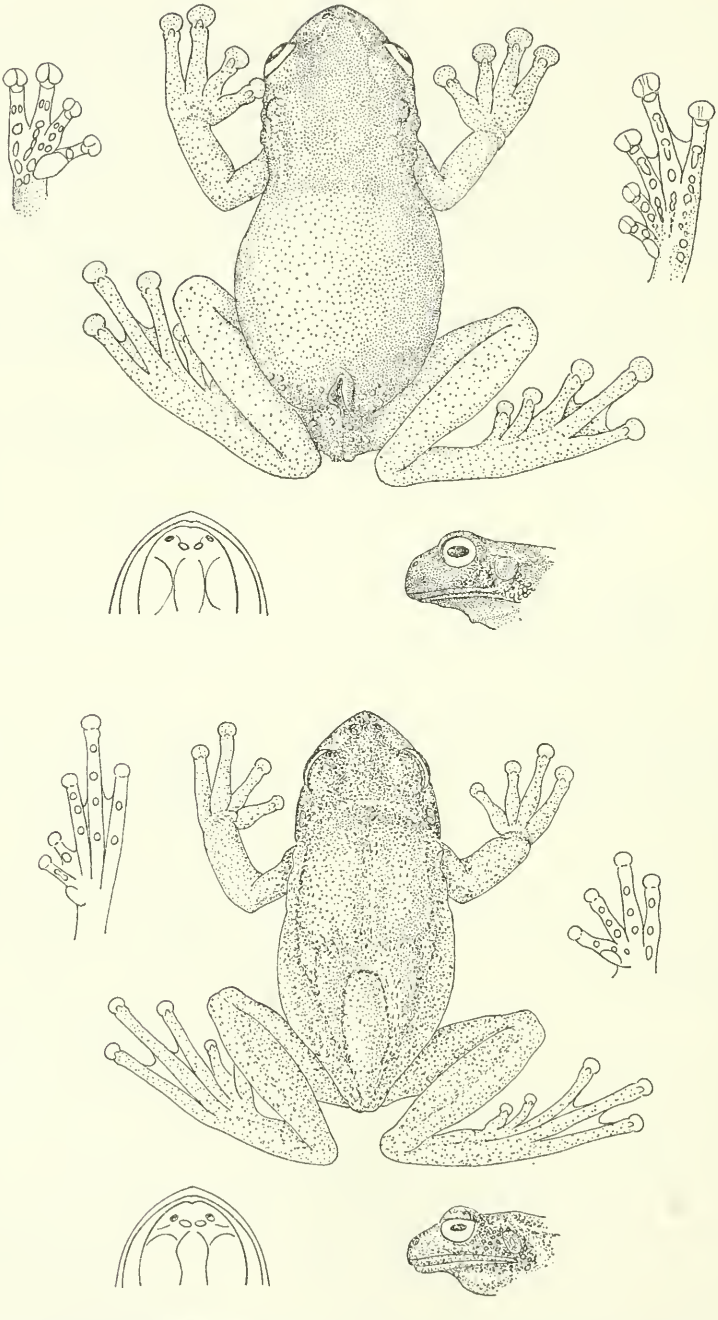

Figure 18.—*Gastrotheca monticola argenteovirens:* CNHM 54811 (at top) from Nariño, and CNHM 63887 from San Pedro in Antioquia (both same size).

its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance half again as great as width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers webbed at base, web reaching base of antepenultimate phalanx of third finger, fourth finger considerably longer than second, reaching to middle of disk of third which covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly less than one-half webbed, the web on fourth toe reaching the base of the antepenultimate phalanx; third and fifth toes subequal; disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches middle of eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap somewhat. No patagium. Skin of upper parts smooth. A well-developed dorsal marsupium present. This is inflated and contains eggs. The opening is a longitudinal slit, 7 millimeters long, that lies 10 millimeters in front of the vent. A rather narrow glandular ridge passes above upper part of tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly granular; a well-developed skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull strongly exostosed.

Dimensions.—Head and body, 59 mm.; head length, 18.7 mm.; head width, 20.3 mm.; femur, 26.4 mm.; tibia, 27.9 mm.; heel-to-toe, 40.7 mm.; hand, 17.4 mm.

Color in alcohol.—Dark lead gray on all dorsal surfaces. Chin and throat gray, belly surface very light gray with thickly scattered flecks of brown. Along the side between axilla and groin and on the anterior face of the thigh fleckings of the pale gray ventral color give a somewhat mottled appearance. Similar but less distinct mottlings occur on the undersurfaces of arms and legs.

Variation.—In color and pattern the series is rather uniform. Some individuals are more heavily mottled below and some have more prominent postocular dark stripes, but in general they are much the same.

Some geographic variation that may be significant is indicated. Preserved specimens from San Pedro in Antioquia are smoother skinned, have more prominent dorsolateral folds, and are more somber in appearance, showing less mottling on the belly and concealed portions of the thighs and groin than do the Nariño and Cauca specimens (see Fig. 18). We are not the first to notice this, for the late E. R. Dunn made a handwritten note on a manuscript key to *Gastrotheca,* under *arqenteovirens,* that the San Pedro form might be new.

Remarks.—Since the correct assignment of the name "*argenteovirens*" has been a problem, we sent two of the large series of specimens from Nariño (CNHM 54823, a male, and 54824, a female) to our good friend Dr. Robert Mertens in Frankfurt and asked him to compare them with the type. He wrote that both he and his colleague, Dr. Klemmer, had made the comparison and both were of the opinion that the two specimens were conspecific with the type. For this we are very grateful.

Specimens Examined

COLOMBIA

Antioquia: Medellín, MCZ 9757–60; San Pedro, MCZ 16080–1, 24916, MZUM 56507, 71217, 78300, 89454, 90599, CNHM 63887–8.

Cauca: Popayán NMS 2676 (photograph of holotype), CNHM 54723; Quintana (Moscopán), CNHM 43981, 44048–9, 54792.

Cundinamarca: Bogotá, MCZ 20936–7.

Nariño: Guaitarilla, 2,000 m., CNHM 54793–843; Túqueres, 3,000 m., CNHM 54844–5.

Tolima: Quindío Mountains, MCZ 8224–6.

Genus *Hyla* Laurenti

1768. *Hyla* Laurenti, p. 32 (type species, *Hyla viridis* Laurenti).

Diagnosis.—Without teeth on mandible, palatine, or parasphenoid; vocal pouch in male, if present, median and subgular; pupil horizontal; sacral diapophysis well expanded in all except some of the larger forms; cranial derm not fused with skull except in a few West Indian species; neither eggs nor young carried on back of female; tympanum present and usually fairly distinct, tongue fairly well fused behind; a well-developed quadratojugal; no backward projecting process on ischium; no well-developed ventrolateral gland along each side.

Remarks.—Following the method used by the senior author in her *Frogs of Southeastern Brazil* (Cochran, 1955) we have divided the large, unwieldy genus *Hyla* into several groups. In many cases these groups coincide with those that the senior author recognized in southeastern Brazil. In other cases the groups here recognized differ either in generally being less inclusive or in not being recognized as groups in the Brazilian work. In the former case, the difference is most often due to the fact that with more material available we have been able to further subdivide some of the earlier, larger groups. In the second case the difference may be due either to the fact that we here recognize groups heretofore not recognized or groups that are not represented in southeastern Brazil.

At present we can recognize 47 species of *Hyla* in Colombia, and these are arranged into 22 groups. Surely when additional studies have been made on the frogs of other geographic areas in South America there will be some rearrangement of the groups we here recognize, but for the time being all we can do is to arrange the Colombian species into such natural groups as we can, and when possible, indicate the relationship of our species groups to extralimital forms.

We do not believe it advisable to present a key to the entire list of species of Colombian *Hyla*; instead, we have attempted to prepare adequate diagnoses for each of the species groups and have then presented a key to the Colombian species within each group.

The groups we here recognize in Colombia and the number of Colombian species now known in each group are as follows:

1. *lanciformis* group, 1 species
2. *crepitans* group, 1 species
3. *maxima* group, 2 species
4. *geographica* group, 2 species
5. *phantasmagoria* group, 1 species
6. *carri* group, 1 species
7. *buckleyi* group, 2 species
8. *albomarginata* group, 2 species
9. *punctata* group, 4 species
10. *granosa* group, 3 species
11. *squalirostris* group, 1 species
12. *rubra* group, 3 species
13. *palpebrogranulata* group, 1 species
14. *labialis* group, 3 species
15. *variabilis* group, 3 species
16. *parviceps* group, 2 species
17. *marmorata* group, 1 species
18. *phlebodes* group, 1 species
19. *minuta* group, 1 species
20. *microcephala* group, 3 species
21. *leucophyllata* group, 8 species
22. *hobbsi* group, 1 species

1. LANCIFORMIS group

This group consists of large tree frogs with a white margin on the upper lip, pointed heads, and reduced webbing between the fingers. Along with *Hyla lanciformis*, at least two other forms are in this group, *H. mulitfasciata* of northeastern South America and *H. boans* of southeastern Brazil.

***Hyla lanciformis* (Cope)**

PLATE 25A–C

1870. *Hypsiboas lanciformis* Cope, p. 556 (type locality, Ecuador).
1882. *Hyla lanciformis*.—Boulenger, 1882a, p. 361; 1884a, p. 637.—Nieden, 1923, p. 268.—Andersson, 1945, p. 63.—Lutz and Kloss, 1952, p. 649.—Goin, 1958, p. 119.—Goin and Layne, 1958, p. 109.—Gorham, 1963, p. 22.
1921. *Hyla microcentra* Werner, p. 180 (type locality, Colombia).—Gorham, 1963, p. 22.

Diagnosis.—A rather large *Hyla* with a pointed snout, fingers showing a trace of web at base, a conspicuous white margin on the upper jaw, and a transverse, horizontal glandular white line above the vent.

The combination of size, white border to upper jaw, and white line above the vent serves at a glance to distinguish this species from any other Colombian *Hyla*.

Description.—USNM 152036, from La Providencia, Río Orteguaza, Caquetá, Colombia. Vomerine teeth in two long angulate series, lying between the very elongate choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border slightly free and shallowly notched. Snout elongate, rather pointed when viewed from above, pointed in profile, the upper jaw extending somewhat beyond lower. Nostrils entirely lateral, not projecting, their distance from end of snout slightly more than one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis strongly defined; loreal region slightly concave and nearly vertical, the upper lip not flaring out appreciably below it. Eye neither large nor prominent, its diameter about three-fourths its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which in turn is about the distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers with a trace of web at base, web just reaching base of antepenultimate phalanx on lateral side, fourth finger considerably longer than second, reaching to disk of third which covers about one-third the tympanic area; no projecting rudiment of a pollex; a weak ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching distal end of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner but no distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches well beyond tip of snout; when limbs are laid along the side, knee reaches axilla; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts very finely granular; a narrow but distinct glandular ridge passes transversely above the vent and similar but less distinct transverse ridges run across each heel. A rather narrow glandular ridge passing above tympanum then continuing above shoulder as a short dorsolateral fold. Skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; no traces of a skinfold across chest; adult male, vocal sac subgular and but slightly apparent. Skin of head not coossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 63.2 mm.; head length, 24 mm.; head width, 19.8 mm.; femur, 36.5 mm.; tibia, 44.2 mm.; heel-to-toe, 56.8 mm.; hand, 22 mm.

Color in alcohol.—A dark chocolate brown frog with rather distinct transverse bars of a darker hue across the top of the head and the back. These transverse dorsal bands vary in width from one to four millimeters, and there are four such bands across the head and eight across the back, those on the back being wider than those on the head. The entire side of the face from the tip of the snout to the tympanum is a dark brownish black. The thighs, shanks, tarsal portion of the feet, and forearms are crossed by dark bands similar to those on the back, but these bands are less conspicuous on the limbs than they are on the dorsum. The ventral surfaces are a dirty brown with distinct pale spots present on the throat and breast. The webs on the feet are dark.

Variation.—The series at hand are rather constant in the presence of a conspicuous white border along the margin of the upper jaw, a transverse white line above the vent, and white blotches in the pectoral region. Otherwise, they are quite variable in pattern. In dorsal ground color they range from pale gray to nearly black, although most are medium to dark brown dorsally. While crossbars are fairly conspicuous on top of the head and dorsum of most, in some the dorsal ground color is practically uniform. Three of the specimens at hand have a dark dorsal median stripe running from the tip of the snout posteriorly to above the urostyle. In most of the specimens this stripe is lacking. The posterior surface of the thigh is rather uniform on most specimens, but on several of them an inconspicuous but distinct row of white spots can be seen; and in one specimen (FM 7r), which is probably from Caño Guapaya, Serranía de La Macarena, there are scattered, small but distinct white spots on the rear of the thighs. In some specimens the disks of the first, second, and third fingers are distinctly capped with bright yellow.

The largest specimen at hand is a female that measures 83.2 millimeters in head and body length.

Remarks.—There seems to be no doubt that *lanciformis* Cope of eastern Colombia, Ecuador, Peru, and western Amazonas in Brazil, *boans* Latreille of southeastern Brazil, and *multifasciata* Günther of Para, Brazil, the Guianas, and the eastern Venezuelan Guayana are three very closely related forms, differing primarily in details of pattern as follows:

lanciformis: Upper lip broadly and conspicuously margined with white, posterior and ventral surfaces of thigh dark and with tiny, scattered white spots.

boans: Upper lip narrowly but not conspicuously margined with white, posterior surfaces of thighs with distinct, scattered, rounded white spots.

multifasciata: Upper lip narrowly but not conspicuously margined with white, posterior surfaces of thighs without white spots.

It is beyond the scope of this paper to draw up detailed synonymies of each of these forms, but it seems that *albopunctata* Spix and *oxyrhina* Reinhardt and Lutken are snyonyms of *boans* and that *microcentra* Werner is a synonym of *lanciformis.*

We give the reasons for using *boans* Latrielle rather than *albopunctata* Spix as the name for the southern form (see Cochran, 1955; Rivero, 1961) in our discussion of the application of the name *Hyla maxima* Laurenti.

When Rivero (1961) studied the Venezuelan forms he felt that *boans* and *multifasciata* were close enough to justify calling them races of a single species. It may be that all three forms are simply geographic races of a single wide-ranging species, but before we make a taxonomic change we prefer to see material from more Amazon Valley localities than are represented in the material presently available to us.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, JRT 516, 520–2, 524–7, USNM 146259–62, 151995–9; UF 8528 (3), 8529 (3), 8530 (2), 8531 (4).

BOYACÁ: Guaicaramo, MLS 36.

CAQUETÁ: La Providencia, on Río Orteguaza, USNM 152035–7; Río Mecaya, CNHM 69738.

META: Serranía de La Macarena(?), FM 7r; Villavicencio, CNHM 60341–2, 81780.

PUTAMAYO: Rumiyaco, 1,000 m., Amazon River side, CNHM 54783–4.

VAUPÉS: Mitú, Río Vaupés, USNM 152318.

ECUADOR: Napo-Pastaza Province, Montalvo, EPN 1343, 1553; Río Bobonaza, JAP 2106, 2235, EPN 2600; 2 km. south of Shell Mera, JAP 2245; Río Villano, EPN 1484, 1767–8; Cabeceras del Río Solis, EPN 1662; Río Pindo, EPN 2500; Río Pucayacu, EPN 1346; Río Suno, Alto Napo, EPN 1644–5; Moruna-Santiago Province, Macuma, EPN 2514; Santiago-Zamora Province, Sucua, JAP 2197–8.

2. CREPITANS group

This group has only one representative in Colombia, and perhaps in all of South America. It is characterized by a rather large size, by the absence of a dermal heel appendage and of reticulations on the palpebral membranes, and by having at least the two terminal phalanges of the outer two fingers free of web.

Hyla crepitans Wied

PLATE 25D–F

1824. *Hyla crepitans* Wied, 1824. pl. 47, fig. 1 (type localities, Tamboril, Jiboya, and Areal de Conquista, Bahia, Brazil); 1824, p. 671; 1825, p. 525.—

Burmeister, 1856, p. 103.—Peters, 1872a, p. 771; 1877, p. 460.—Boulenger, 1882a, p. 352; 1903, p. 481.—Boettger, 1885, p. 247; 1892, p. 40; 1893, p. 40.—Werner, 1899, p. 482.—Günther, 1901, p. 283.—Stejneger, 1901, p. 181.—Baumann, 1912, p. 163.—Peracca, 1914, p. 108.—Beebe, 1919, p. 207; 1952, p. 174.—Ruthven, 1922, p. 55.—Nieden, 1923, p. 304.—A. Lutz, 1927, pp. 38, 43.—Nicéforo María, 1930, p. 104.—Crawford, 1931, p. 34.—Schmidt, 1932, p. 160.—Liu, 1935, p. 34.—Parker, 1935, p. 511; 1936, p. 2.—Miranda-Ribeiro, 1937a, p. 55.—Hellmich, 1939, p. 391.—Schubart, 1939, p. 52.—Shreve, 1947a, p. 536.—B. Lutz, 1951a, p. 320.—Schmidt and Inger, 1951, p. 447.—Aleman, 1952, p. 27; 1953, p. 224.—Cochran, 1955, p. 66.—Stebbins and Hendrickson, 1959, p. 520.—Goin, 1961, p. 11.—Gorham, 1963, p. 21.—Rivero, 1963a, p. 93; 1963b, p. 199; 1964a, p. 301; 1964b, p. 311.

1830. *Hypsiboas crepitans.*—Wagler, 1830, p. 200.—Cope, 1867, p. 200; 1874b, p. 121.

1841. *Hyla doumercii* Duméril and Bibron, p. 551 (type locality, Suriname).—Günther, 1858, p. 101.—Cope, 1867, p. 201.—Boulenger, 1882a, p. 352.—B. Lutz, 1951a, p. 320.

1841. *Hyla xerophilla* Duméril and Bibron, p. 549 (type locality, Cayenne).—Guibé, 1949, p. 24.

1867. *Hypsiboas circumdatus* Cope, p. 200 (type locality, Brazil); 1871a, p. 555.

1871. *Hyla indris* Cope. 1871a, p. 555 (type locality, Suriname).—Boulenger, 1882a, p. 353.—Boettger, 1892, p. 40.—Beebe, 1919, p. 207.—Nieden, 1923, p. 305.

1882. *Hyla circumdata.*—Boulenger, 1882a, p. 353.—Baumann, 1912, p. 163.—Nieden, 1923, p. 305.—Miranda-Ribeiro, 1926, p. 92.—Barbour and Loveridge, 1929, p. 278.—B. Lutz, 1951b, p. 707.

Diagnosis.—A rather large tree frog without dermal appendages on the heels or reticulations on the palpebral membranes but with a transverse, generally whitish. glandular line above the vent and with at least the two terminal phalanges of the outer three fingers free of web.

In general appearance *Hyla crepitans* is more similar to a half-grown *maxima* or *rosenbergi* than to any other Colombian frog, but it may be readily distinguished from both of these by having the two terminal phalanges of the outer three fingers free of web.

Description.—CNHM 61169, from, Catival, upper Río San Jorge, Córdoba, Colombia. Vomerine teeth in two short, heavy angulate-shaped series, lying close together between the rather large, oblong choanae; tongue two-thirds as wide as mouth opening. very broadly cordiform, its posterior border entirely fused and shallowly notched. Snout moderate, somewhat pointed when viewed from above, somewhat rounded in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis moderately defined; loreal region concave but not too oblique, the upper lip flaring out only moderately below it.

Eye large, very prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is in turn slightly greater than distance between nostrils. Tympanum very distinct, about four-fifths the diameter of eye, separated from eye by a distance equal to about one-third its own diameter. Fingers webbed at base, web on third finger extending to middle of antepenultimate phalanx on lateral side, to base of antepenultimate phalanx on medial side, fourth finger longer than second, reaching to proximal one-third of disk of third finger which covers about one-half the tympanic area; a moderately projecting rudiment of a pollex; a low ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; an inner but no outer tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region definitely narrower than greatest width of head; when hind leg is adpressed, heel reaches well beyond tip of snout; when limbs are laid along the side, knee reaches nearly to axilla; when hind legs are bent at right angles to body, heels considerably overlap. No patagium. Skin of upper parts smooth; a well-developed narrow glandular ridge encircling upper part of tympanum; skin of throat and chest finely granular, that of belly and lower surface of thigh uniformly and more coarsely granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 60.5 mm.; head length, 21.2 mm.; head width, 20.8 mm.; femur, 33.8 mm.; tibia, 37.3 mm.; heel-to-toe, 45.8 mm.; hand, 17.8 mm.

Color in alcohol.—A very light brown frog with faint dorsal blotches of medium brown. These dorsal blotches are rather indefinite and not at all prominent. They are present around the nares, on top of the head, and on the back from the suprascapular to the sacral region. Very faint, broad bands cross the dorsal surfaces of the thighs and shanks. The posterior surfaces of the thighs are heavily mottled with brown on a pale yellowish background. The ventral surfaces are immaculate.

Variation.—While structurally there seems to be little variation in *H. crepitans*, pattern-wise the opposite is true. Some specimens are a uniform tan to brown above; others have the dorsal surface tan heavily mottled with dark brown. One specimen (MLS 210) is medium dark brown dorsally heavily flecked with pencil-like dark dots. In some of the specimens the hind limbs are crossed with distinct, broad, dark bands, in others the thighs are uniform dorsally and heavily mottled posteriorly, while in a few hardly any markings of any type are discernible on the thigh. While the majority of the specimens are uniform pale underneath, some of them have dusky flecks along the side of the chin and throat and a few are actually dark underneath the throat. The three largest specimens at hand are 73.7, 73.8, and 74.6 millimeters in head and body length.

Remarks.—We agree with Guibé (1949, p. 24) that *Hyla xerophilla* is a synonym of *H. crepitans*, as we have noted that it differs from the latter only in two minor respects: It has some small, silvery white spots scattered over the dorsal surface, and on each heel it has a wart which is enlarged to the point that it verges on being a dermal appendage. Fresh material from Surinam indicates that *Hyla indris* should also be included in the synonymy of *H. crepitans*.

Specimens Examined

COLOMBIA

Atlántico: Barranquilla, BM 1909.7.23.7, CJG 2455; Los Pendales, USNM 152142; Palmar de Varela, CJG 2323–5.

Antioquia: Nechí, CNHM 54778, 54780–2; Puerto Berrio, MZUM 56506, BM 1929.2.1.11; San Pedro, near Medellín, MCZ 7777.

Bolívar: La Raya, USNM 127863–4; Sincelejo-Tolú, CJG 2456 (7); Tolú, CJG 2291–3, 2448–9; Villanueva, USNM 117513.

Boyacá: Guaicaramo, MZUM 78303 (4); Muzo, MCZ 24917; Puerto Boyacá, Río Magdalena, USNM 152144; Sutatenza, MLS 285.

Córdoba: Alto de Quimarí, CNHM 61751; Catival, upper Río San Jorge, CNHM 61169–70; Socarré, upper Río Sinú, CNHM 61168; Tierra Alta, CNHM 61752.

Cundinamarca: Beltrán, upper Río Magdalena, USNM 152611–2; Bogotá, MCZ 9727; Finca El Cucharo, near Tocaima, USNM 152182–3; Garagoa, northeast of Bogotá, MCZ 16078; Monte Redondo, USNM 152185; Nilo, CJG 2450; San Javier, La Mesa, USNM 152181; Villeta, MCZ 20940, 20946

Guajira: Arroyo de Arenas, MZUM 54619.

Magdalena: Aracataca, ANSP 19770; Ciénaga, CJG 2315–6; Fundación, IOC 4686, MZUM 46908–21; Medialuna, NHMW 34; Palomino, IOC 4765, MZUM 48302; Río Buritaca, CJG 2451; Río Frío, MCZ 16051; Santa Marta, MCZ 2326–8, 2330–1.

Meta: Grenada, on Río Ariari, south of Villavicencio, USNM 151946–61; Villavicencio, CNHM 81781–2, CJG 2320–2, USNM 152209–14, NHMW 82 (2), USNM 146264; near Villavicencio, USNM 151982.

Norte de Santander: Astillero, MLS 210; La Selva, USNM 152115; Miramonte, Tibú (Río Catatumbo), USNM 152263–76.

Santander: San Gil, CM 7932–4.

Tolima: Espinal, MCZ 15062–4; Honda, CM 2489, USNM 152121–2; Mariquita, CNHM 81821, USNM 152286–7, JRT 93.

Valle: Near Bitaco, on way to Dagua, USNM 151982; La Concepción, MCZ 2324–5.

BRAZIL: Minas Gerais, Arrias do Callias, MCZ 1873; Pernambuco, Bonita, MCZ 2825.

FRENCH GUIANA: Cayenne, MHNP 752 (type of *Hyla xerophilla*).

PANAMA: Summit, Canal Zone, MCZ 17971; Las Sabanas, MCZ 17582–3.
SURINAM: Zanderij, CJG 2402–7.
TRINIDAD: MCZ 2204.
VENEZUELA: Falcón, Acosta District: Panji, MCZ 25978–3; Recito, MCZ 26142. Mérida, MCZ 2525. Paria Peninsula, Güiria, MCZ 23024–8.

3. MAXIMA group

A group of large frogs generally brownish in color, with moderately to fully webbed fingers, with or without reticulations on the palpebral membranes or dermal heel appendages. In addition to the species recorded from Colombia (*maxima* and *rosenbergi*) such forms as *faber* and *pardalis* are members of this group.

The two species known from Colombia may be distinguished by the following key:

a^1. Palpebral membranes reticulate, a triangular dermal appendage on heel, webs of hands and feet dusky . . . . **H. maxima**
a^2. Palpebral membrane not reticulate, no dermal appendage on heel, webbing on hands and feet clear . . . . **H. rosenbergi**

Hyla rosenbergi Boulenger

PLATE 26D–F

1898. *Hyla rosenbergi* Boulenger, 1898a, p. 123 (type locality, Cachabi, Esmeraldas, Ecuador).—Noble, 1925, p. 10; 1927, p. 97; 1931, pp. 68, 104.—Breder, 1925, p. 329; 1927, p. 73; 1946, p. 409.—Nieden, 1926, p. 264.—Liu, 1935, p. 35.—Netting, 1935, p. 15.—Thornton, 1964, p. 188.

Diagnosis.—A large *Hyla* with fingers rather fully webbed; closely allied to *H. maxima.*

This species can be distinguished from *H. maxima* by the absence of dermal heel appendages and reticulations on the palpebral membranes and by having the webs between the fingers and toes pale rather than dusky. From *H. faber* it differs in having the fingers fully webbed rather than having the webbing reduced. Young specimens of *maxima* might be confused with *H. crepitans,* but *maxima* likewise differs from *crepitans* in having the fingers nearly fully webbed.

Description.—CNHM 61167, from upper Río Sinú, Socarré, Córdoba, Colombia. Vomerine teeth in two heavy /‾\ series, lying close together between the large elongate choanae (in this specimen the posterior ramus of the right vomerine patch is missing); tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border very slightly free and truncate but unnotched. Snout large, U-shaped when viewed from above, nearly truncate in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout equal to about one-fourth that from eye, separated from each other by an interval equal to about three-fifths their distance from eye. Canthus rostralis well defined; loreal region concave and very oblique, the upper lip flaring out strongly below it. Eye large, but not particularly prominent, its diameter not quite equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about the diameter of eye, separated from eye by a distance nearly equal to one-third its own diameter. Fingers webbed, web extending to middle of penultimate phalanx of third finger on lateral side and base of penultimate phalanx on medial side; fourth finger considerably longer than second, reaching to base of disk of third which covers about one-third the tympanic area; a projecting rudiment of a pollex; a very low and indistinct ulnar ridge. Toes nearly completely webbed, the web on fourth toe reaching to middle of penultimate phalanx and thence as a narrow margin to base of disk; third and fifth toes subequal, disk of fourth toe covering about one-fourth the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a low but distinct tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth; a glandular ridge encircling upper part of tympanum; skin of throat and chest finely granular, that of belly and lower surface of thigh uniformly and not so finely granular; no traces of a skinfold across chest; adult male, vocal sac hardly apparent. Skin of head not coossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 82 mm.; head length, 27.5 mm.; head width, 26.5 mm.; femur, 44.5 mm.; tibia, 49.2 mm.; heel-to-toe, 60.7 mm.; hand, 24.6 mm.

Color in alcohol.—A very light brown above, a tannish brown below. A dark chocolate brown thin line originates on top of snout just posterior to nostrils and passes backward as a median line to a point about halfway between sacral hump and vent. There are faint indications of dorsal blotches and some more definite blotches on each side anterior to the groin but these are not arranged into distinct vertical bars although they show a tendency toward such an arrangement. A dark horizontal line about a half-inch long passes through the vent and similar horizontal lines pass across each heel and become contiguous with the line on vent when legs are flexed. The webbing on hands and feet is no darker than the rest of the appendages.

Variation.—Structurally, there is not much variation in the series at hand.

In terms of color and pattern the specimens show more variability. Some are quite pale while others are quite dark, but this does not seem to have any geographic significance for our palest and darkest specimens came from the same locality. All specimens show some degree of mottling on the back but the amount of contrast between the darker mottling and the lighter ground color ranges from almost imperceptible to conspicuous. Here again there seems to be no geographic correlation for the two most conspicuously mottled individuals before us came from the Panama Canal Zone and the Río Calima in Valle, Colombia.

Remarks.—While *H. rosenbergi* is certainly closely related to *H. maxima* and at first glance seems very similar to it, the differences between the two seem significant and constant. The characteristics indicated in the following tabulation should help in distinguishing these two species.

Character	*H. rosenbergi*	*H. maxima*
Tympanum	Nearly as large as eye and set very close to it.	Hardly half the size of eye and separated from it by a distance nearly equal to its own diameter.
Palpebral membrane	Clear.	Reticulate.
Dermal appendage on heel	Not present.	Present.
Lateral ramus of vomerine tooth row	Only slightly longer than median ramus.	Generally much longer than median ramus.
Webbing on hands and feet	Pale.	Dark.

A single specimen (CJG 2258) collected by the junior author on the Río Calima was, in life, pale tan dorsally and bright orange along the sides, in the groin, on the anterior and posterior surfaces of thighs, under the arms and feet, and on the webs of both hands and feet.

The distribution of *H. rosenbergi* is still a problem (Netting, 1935, p. 15). The species apparently is abundant in northwestern Ecuador and southwestern Colombia; has been recorded from both the Pacific (Río Chucunague) and Atlantic (Río Chagres) drainages from Panama; and is here recorded from the Atlantic drainage (Río Sinú) of Colombia for the first time. There are no records of it from the Río Atrato in Chocó, Colombia, although *H. maxima* has been recorded there. In view of these records it seems likely that *rosenbergi* will some day be found to occur in the lowlands of all of western Colombia and all of northern Colombia west of the Maracaibo drainage.

A detailed life history of this species in Panama has been published by Breder (1946).

Specimens Examined

COLOMBIA

Córdoba: Socarré, upper Río Sinú, CNHM 61167.

Valle: Río Calima, CJG 2258, 2460–2; USNM 152313–5; Río Raposo, USNM 151385–7.

ECUADOR: Esmeraldas Province, Cachabi, BM 98.4.28.147–51 (types of *Hyla rosenbergi*); vicinity of Cachabi, JAP 2900–11, 2913–5, 2936–44, 2983–4, 3034–6, 3038, 3040; San Lorenzo, EPN 4027; Pichincha Province, Baja Río Toachi, EPN 3080; Pacto, EPN 4280; Nanegal, OV 113; northwestern Ecuador, Río Cayapas, CM 10090.

PANAMA: Alhajuela (10 mi. above Gamboa), CM 7418.

***Hyla maxima* (Laurenti)**

Plate 26a–c

1758. *Rana boans* Linnaeus, p. 213 (type locality, America).—Gmelin, 1789, p. 1055.—Andersson, 1900, p. 17.
1768. *Rana maxima* Laurenti, p. 32 (type locality not known).
1799. *Calamita maxima.*—Schneider, 1799, p. 163.
1802. *Rana zebra* Shaw, p. 123 (type locality, Carolina and Virginia).
1803. *Hyla palmata* Daudin, p. 26 (type locality, Cayenne); 1803, p. 79.—Tschudi, 1838, p. 72.—Duméril and Bibron, 1841, p. 544.
1820. *Calamita palmatus.*—Merrem, 1820, p. 173.
1830. *Hypsiboas palmata.*—Wagler, 1830, p. 200.—Cope, 1867, p. 200.
1858. *Hyla maxima.*—Günther, 1858, p. 99.—Peters, 1873a, p. 218.—Boulenger, 1882a, p. 349.—Werner, 1897, p. 217.—Andersson, 1900, p. 17; 1945, p. 66.—Peracca, 1904, p. 36.—Beebe, 1919, p. 207; 1952, p. 174.—Nieden, 1923, p. 300.—Miranda-Ribeiro, 1926, p. 75.—Crawford, 1931, p. 33.—Noble, 1931, p. 118, 509.—Crawford and Jones, 1933, p. 89.—Parker, 1933, p. 5.—Liu, 1935, p. 34.—Lutz and Kloss, 1952, p. 650.—Goin, 1958, p. 120.—Goin and Layne, 1958, p. 109.—Dowling, 1960, p. 137.—Gorham, 1963, p. 22.—Thornton, 1964, p. 188.
1896. *Hyla lactea* Lönnberg, p. 13 (substitute for *Hyla boans* L.).
1900. *Hyla boans.*—Andersson, p. 17.—Rivero, 1961, p. 96.
1931. *Hyla wavrini* Parker, p. 2 (type locality, Upper Orinoco, Amazonas, Venezuela).—Rivero, 1961, p. 97.—Gorham, 1963, p. 23.
1941. *Hyla miranda-ribeiri* Melin, p. 20 (type locality, Taracuá, Río Vaupés, Brazil).—Gorham, 1963, p. 22.

Diagnosis.—A large *Hyla* with reticulations on the palpebral membranes, triangular dermal appendages on heels, hands and feet fully webbed, and the webbing between fingers and toes dusky to dark gray.

H. maxima differs from *geographica* by having the fingers fully webbed and by the webbing being dusky to dark gray rather than clear; from *pardalis* by having reticulations on the palpebral membrane; and from *faber* and *rosenbergi* by having reticulations on the palpebral membrane, dermal appendages on the heels, and webbing dusky between fingers and toes.

Description.—CNHM 54789, from Pueblorrico, Caldas, Colombia. Vomerine teeth in two heavy /‾\ series, lying close together between the large, oblong choanae; tongue three-fourths as wide as mouth, opening, broadly cordiform, its posterior border very slightly free and very shallowly notched. Snout large, broadly triangular when viewed from above, rounded in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-fourth that from eye, separated from each other by an interval equal to about one-half their distance from eye. Canthus rostralis well defined; loreal region concave and very oblique, the upper lip flaring out strongly below it. Eye moderate, fairly prominent, its diameter not quite as great as its distance from nostril; palpebral membrane reticulate; interorbital distance half again as great as width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers webbed, the web on third finger reaching base of disk on lateral side and middle of penultimate phalanx on medial side, fourth finger longer than second, reaching to middle of disk of third which more than covers the tympanic area; rudiment of a pollex not pronounced; a low ulnar ridge. Toes completely webbed, the web on fourth toe reaching the base of the disk; third and fifth toes subequal, disk of fourth toe slightly larger than the tympanic area; a distinct oval inner but no apparent rounded outer metatarsal tubercle; a very indistinct tarsal ridge; a short broad triangular dermal appendage on heel. Body elongate, in postaxillary region but little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap slightly. No patagium. Skin of upper parts smooth; a low indistinct glandular ridge encircling upper part of tympanum, skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 90 mm.; head length, 30.6 mm.; head width, 32.1 mm.; femur, 47.2 mm.; tibia, 49.3 mm.; heel-to-toe, 63.8 mm.; hand, 27.3 mm.

Color in alcohol.—Pale brown above, dirty tannish gray below. The dorsal pattern consists of a narrow median stripe that extends from tip of snout to about the sacral hump, where it fades out. Some dozen small brownish spots, a few millimeters in diameter, are scattered over the back, with most of them clustered in middle of the back above shoulder region. Along each side between the axilla and groin is a series of vertical dark bars, these becoming more distinct posteriorly in region of the groin. Rather indistinct crossbars occur on the dorsal surfaces of thighs, shanks, feet, and forearms. Posterior surfaces of thighs, underside of feet, and webbing of hands and feet are a very dark gray that approaches black.

Variation.—The series at hand, while structurally quite uniform, shows considerable variation in pattern. Most of the specimens are brownish with a dark, narrow, median dorsal stripe running from the tip of snout to above the urostyle. A few, particularly those from the Río Atrato, seem to have the webs paler than others, but the triangular dermal heel appendage and the reticulate palpebral membrane seem to indicate that such specimens definitely are *maxima* rather than *rosenbergi.*

We have examined the specimen from San Fernando de Atabapo in Venezuela (USNM 80652) mentioned by Rivero (1961, p. 97) and find that it is structurally typical *maxima,* although it does have an abortive dorsal pattern.

Geographically speaking, the specimens that show the most divergence from "typical" *maxima* are two frogs collected by Dr. Medem on the Serranía de La Macarena. These specimens are 75.7 and 73.3 millimeters in head-and-body length, compared to five adult specimens (taken at random from the series before us) that range from 87.7 to 107.2 millimeters in length. In addition to size, these two specimens differ in that their throats are quite dark (whereas most examples of *maxima* have light throats, or, at most, dusky throats) and their fingers and toes are much more slender and delicate, with the webbing on the fingers being more reduced and the webbing itself being much darker than it is in the average *maxima.*

The largest specimen at hand, from Leticia, measures 115 millimeters in head-and-body length.

Remarks.—There can be no doubt that this frog was first named *Rana boans* by Linnaeus in the tenth edition of his *Systema Natura.* That name was overlooked, however, until 1900 when it was resurrected by Andersson (1900, p. 17). In the meantime Laurenti (1768, p. 32) gave the name *maxima,* which became adopted as the name for the species and was used widely for many years (Günther, 1858; Peters, 1872; Boulenger, 1882; Nieden, 1923; Miranda-Ribeiro, 1926; Crawford, 1931; Noble, 1931; Andersson, 1945).

On the basis that *boans* Linnaeus, 1758, preoccupied *boans* Latreille, 1801, Cochran (1955, p. 80) used the name *albopunctata* for the frog of southern Brazil allied to *lanciformis* of Colombia which had for so long been known as *boans.*

Goin and Layne (1958, p. 111) argued that, on the basis of the Copenhagen decisions (Hemming, 1953, p. 25), it would be better to leave the name *maxima* for the frog so long known under that name and to consider the *boans* Linnaeus, 1758, a *nomen oblitum* pending the precise wording in the revised Code. This precise wording is now available (International Code of Zoological Nomenclature, London, 1961, Art. 23,b), and on this basis we consider *boans* Linnaeus, 1758, as unavailable (Code, Art, 23,b, ii) and use the name *maxima* Latreille, 1768, for the frog so long known under that name.

With the suppression of the name *boans* Linnaeus, 1758, the name *boans* Latreille, 1801, becomes available for the frog that Cochran called *albopunctata* from southern Brazil (Cochran, 1955, p. 80).

So far as we know, the only recent major work to use the name *boans* for what we here call *maxima* is that of Rivero (1961, p. 96).

The names of two recently described forms seem to be synonyms of *H. maxima.* We have examined the paratype of *Hyla wavrini* and it seems to be *maxima* without any question. Parker (1936, p. 2) quite properly diagnosed it as separate from *faber* and *rosenbergi* but apparently he did not compare it with *maxima.* On direct comparison with specimens of *rosenbergi*, *faber*, and *maxima*, the specimen in the British Museum proved to be, in our opinion, a specimen of *maxima* without any doubt. Examination of the specimen that Melin used as the type of *Hyla miranda-ribeiri* demonstrated that it likewise is a *maxima.* It has the reticulate palpebral membrane, dermal appendages on the heels, and dusky webbing on the hands and feet, all characteristic of *maxima.*

With the assignment of *wavrini* and *miranda-ribeiri* to synonymy there are still three closely related, large, very similar appearing tree frogs that are apt to be confused; namely, *maxima*, *rosenbergi*, and *faber*. These frogs generally are tannish to brownish in dorsal ground color and often have a narrow dark median stripe down the back. Although these frogs are all closely related they are not just races of a single species, for two of them, *maxima* and *rosenbergi*, have overlapping ranges in the Río Dagua drainage in southwestern Colombia. While *rosenbergi* is a frog of the Pacific coast in South America (one record from Córdoba, Colombia), *maxima* is wide-ranging through the Amazon Valley from French Guiana to the eastern slope of the Andes, and it also occurs in the Río Atrato drainage of Chocó and has penetrated southward to the valley of the Río Dagua in northern Valle. We suspect that *maxima* most likely reached the Río Atrato drainage by way of the Atlantic coast of Colombia rather than across the Andes, and that the absence of records for much of the northern coast of Colombia is due simply to lack of collecting.

Dr. Orcés-V. of the Escuela Politecnica Nacional tells us that *maxima* is eaten regularly by the Indians, who call it "cagua."

Specimens Examined

COLOMBIA

Amazonas: Caño Guacayá, USNM 152130; Leticia, MLS 15, UF 8532, 8533 (2), 8534 (2), USNM 146263; Puerto Nariño, USNM 152128–9; Raudal Jirijirimo, USNM 152132–3, MCZ 28051; Río Apaporis, USNM 152134–5.

Antioquia: Urabá, CNHM 63894–6; Villa Arteaga, CNHM 78143–4.

Boyacá: Guaicaramo, USNM 152101–4; Macanal, MLS "b," MZUM 71216.

Caldas: Pueblorrico—Santa Cecilia, CNHM 54785–91.

Caquetá: Florencia, MLS 49; La Providencia, Río Orteguaza, MLS 53; Morelia, ANSP 25314.

Chocó: Condoto, BM 1913.11.12.116–7; Quibdó, MLS 194; Sautatá, CNHM 73797; Serranía de Baudó, ANSP 25310.

Córdoba: Upper Río Uré; CJG 2464 (6).

Meta: Near mouth of Caño Losada, USNM 152189; near El Refugio, USNM 152194; "El Mico," USNM 15220; forest between Macarena and Guayabero, USNM 152195; Serranía de La Macarena, USNM 152630–1; Villavicencio, CNHM 30575, MCZ 11622–3.

Valle: Los Mangos, BM 1908.5.29.67; Río Raposo, south of Buenaventura, USNM 151385–6, 151989, 151998–9.

Vaupés: Río Cuduyari, USNM 152319; Río Popoyacá, USNM 152131.

BRAZIL: Río Vaupes, Taracua, NM 7896, ex. 466 (type of *Hyla mirandaribeiri*).

ECUADOR: Napo-Pastaza Province, Montalvo, JAP 3732, 3745, EPN 1548–52, 1637–8; Cabeceras del Río Solis, JAP 3746, EPN 1647–8, 1658–61; Cabeceras del Río Bobonaza, JAP 2233–4, EPN 1715–6; Río Villano, EPN 1722; Loreto, EPN 1615, 2023–4; Chicherota, EPN 2451–2; Alto Napo, EPN 3557; Rio Conambo, EPN 1829; Río Llushin, EPN 1753; Cabeceras del Río Capahuari, EPN 1446, 1932; Payamino, EPN 4044–5; Río Pucayacu, EPN 1345; Boca de Guataracu, EPN 1357; "Region de Puyo," EPN 1678.

FRENCH GUIANA: Cayenne, MHNP 4618 (type of *Hyla palmata*).

VENEZUELA: San Fernando de Atabapo, USNM 80652; upper Orinoco, BM 1936.10.10.1 [1947.2.23.30] (paratype of *Hyla wavrini*).

4. GEOGRAPHICA group

Moderate-sized tree frogs with elongate dermal appendages on the heels and reduced webbing between the fingers. The two Colombian species may be distinguished by the following key:

a^1. Palpebral membrane reticulate, fingers about one-half webbed. **H. geographica geographica**

a^2. Palpebral membrane clear, fingers with just a trace of web . . **H. calcarata**

Hyla geographica geographica Spix

Plate 27a–c

1824. *Hyla geographica* Spix, fig. 1 (type locality unknown).—Burmeister, 1856, p. 99.—Günther, 1858, p. 99.—Müller, 1922, p. 170.—Lutz and Kloss, 1952, p. 649.—Gorham, 1963, p. 22.—Rivero, 1964a, p. 303.

1862. *Hyla spectrum* Reinhardt and Lütken, p. 195 (type locality, Brazil, by inference).—Lutz, 1927, p. 64.

1882. *Hyla appendiculata* Boulenger, 1882a, p. 349 (type locality, here restricted, Canelos, Ecuador).—Werner, 1897, p. 220; 1901, p. 600.—Baumann, 1912, p. 99.—Nieden, 1923, p. 301.—Miranda-Ribeiro, 1926, p. 93.—Andersson, 1945, p. 70.

1933. *Hyla punctatissima appendiculata*.—Parker, 1933, p. 5.

1935. *Hyla geographica geographica*.—Parker, p. 511.—Cochran, 1955, p. 180.

Diagnosis.—A moderate-sized tree frog with the palpebral membranes reticulate, a spur-like dermal appendage on the heel, and the fingers about one-half webbed.

This subspecies may be distinguished from all Colombian *Hyla* except *H. maxima* by the reticulations on the palpebral membranes. It may be readily distinguished from *H. maxima* by the much larger appendage on the heel and by having the fingers only one-half webbed. In the structure of the dermal heel appendage it is most like *Hyla calcarata*, but it differs from that species in having the palpebral membranes reticulate and in having the fingers about one-half webbed rather than with just a trace of web.

Description.—MLS 64, an adult female from Guaicaramo, Boyacá, Colombia. Vomerine teeth in two heavy angulate series which touch on the midline and lie between the large, oblong choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border fused and very shallowly notched. Snout moderate, broadly triangular when viewed from above, somewhat truncate in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region concave and oblique, the upper lip flaring out rather strongly below it. Eye not large, nor particularly prominent, its diameter equal to its distance from nostril; palpebral membrane reticulate; interorbital distance half again as great as width of upper eyelid, which is only slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance about equal to one-third its own diameter. Fingers more than one-half webbed, the web reaching base of the penultimate phalanx of the fourth finger on the lateral side and extending thence as a narrow margin on the medial side; fourth finger considerably longer than second, just reaching to middle of disk of third which covers about two-thirds the tympanic area; no projecting rudiment of a pollex; a distinct ulnar ridge. Toes three-fourths webbed, web on fourth toe reaches base of penultimate phalanx, on all other toes it reaches to base of disk; third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner but no distinct outer metatarsal tubercle; a weak but distinct tarsal ridge; an elongate dermal appendage on heel. Body somewhat elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts very finely granular; a narrow, quite distinct glandular ridge encircling upper part of tympanum, then passing downward to angle of jaw; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; no trace of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 53.7 mm.; head length, 19.4 mm.; head width, 20 mm.; femur, 27.2 mm.; tibia, 29.7 mm.; heel-to-toe, 38 mm.; hand, 15.5 mm.

Color in alcohol.—A dark frog. On the very dark dorsum an even darker blotch can be distinguished. This blotch anteriorly has a narrow ramus that extends to the hind corner of eye on each side and thus makes a Y-shaped pattern. Posteriorly the blotch again divides to send a ramus to each lateral extension of the sacral hump. The rami are in turn connected by a narrow bar at the level of the sacral hump, from the middle of which two posteriorly projecting horns diverge. The entire side, from axilla to groin, is marked with distinct, light-centered vertical bars. Similar bars are present on the anterior face of each thigh. These continue over the dorsal and posterior surfaces of the thighs but are less conspicuous there due to the more intense pigmentation of the ground color. Less-distinct narrow cross-bars are also present on the shanks. The ventral surfaces are immaculate.

Variation.—When the above-described specimen (MLS 64) is compared with one of the cotypes of *appendiculata* (BM 74.7.16.7 [1947.-2.13.7]) from the interior of Brazil, several differences can be noted. In the cotype of *appendiculata*, the tympanum is about three-fourths the diameter of the eye and is in contact with it, while in MLS 64 the tympanum is little more than half the diameter of the eye and is separated from it by one-half its own diameter. In the cotype there is a definite gap between the vomerine series; in the MLS specimen they meet on the midline, the two series being continuous. The cotype is somewhat faded and at present the dorsal pattern consists of narrow, pencil-like, transverse markings across the tan dorsal background; in the MLS specimen, which is quite dark dorsally, the dorsal markings are broad rather than pencil-like. The patterns of the sides and the thighs seem to be about the same in both specimens. We strongly suspect that the differences in the tympanum and (possibly) in the teeth are due either to sex or to geography.

Most of the adult specimens from the northern part of the range fall within the range of variation discussed above. Parker (1933, p. 5), however, reports that the young have quite an ontogenetic change in color and pattern. He describes young individuals as having a pattern similar to that of adult *calcarata*, but since that species lacks the reticulations on the palpebral membrane it should be readily separable from young *H. geographica geographica*.

Boulenger included a specimen from Bahia (BM 69.11.3.25 [1947.2.13.6]) in the series of cotypes of *appendiculata*. That specimen probably should be referred to *H. geographica punctatissima*, as it is much paler than the northern form of *H. geographica* dorsally, and the belly is uniformly, but not thickly, speckled. There is a beautiful bright yellow spot on each heel.

Remarks.—Lutz and Kloss (1952, p. 649) point out that all their specimens from the upper Amazon region were taken in the daytime on the forest floor, but always near still or slowly flowing water. Their young specimens were the slate-blue color of early metamorphosed forms, but even at that early age they had the reticulations on the palpebral membranes which are characteristic of the species.

Specimens Examined

COLOMBIA

Boyacá: Guaicaramo, MLS 64 (5), USNM 152100.

Cundinamarca: Eastern base of cordillera of Bogotá, ANSP 24401.

BRAZIL: All cotypes of *appendiculata*: Bahia, BM 69.11.3.25; Para, Santarem, BM 75.10.22.10–1; interior of Brazil, BM 74.7.16.7.

ECUADOR: Napo-Pastaza: Canelos, BM 80.12.5.166–8 (cotypes of *appendiculata*), Sarayacu, BM 80.12.5.234 (cotype of *appendiculata*); San Jose Viejo de, Sumaco, JAP 3758; Copataza, alto Pastaza, JAP 3797; Río Llushin, "N. de Arapicos," EPN 2733; Alto Oglan, EPN 4115–7; Alto Río Pucayacu, Bobonaza, EPN (unnumbered specimen); Chichirota, Baja Bobonaza, EPN 1333; Río Pucayacu, EPN 1349–50; Río Conambo, EPN 1352–3; Loreto, Alto Napo, EPN 1356; 2036; Río Villano, EPN 1486–7; Río Pindo, EPN 1521, 2501; Boca del Coca, EPN 3889; Río Rutuno, EPN 3519; "region de Puyo," EPN 1689; Río Verde, "afluente del Río Pastaza," EPN (two unnumbered specimens).

Hyla calcarata Troschel

Plate 27d–f

1848. *Hyla calcarata* Troschel, p. 660 (type locality, British Guiana).—Boulenger, 1882a, p. 359.—Nieden, 1923, p. 306.—Andersson, 1945, p. 69.—Lutz and Kloss, 1952, p. 647.—Gorham, 1963, p. 20.

1862. *Hypsiboas fasciatus.*—Cope, 1862b, p. 354.

1867. *Hyla calcaratus.*—Cope, 1867, p. 200.

1904. *Hyla fasciata.*—Lidth, 1904, p. 94.—Beebe, 1919, p. 208.—Crawford, 1931, p. 34.

Diagnosis.—A moderate-sized *Hyla* apparently allied to *H. geographica*, with dark markings in region of groin and on anterior and posterior faces of thighs, with exceedingly well-developed dermal spurs on heels, and without reticulations on the palpebral membranes.

Superficially, *H. calcarata* closely resembles *H. pardalis*, but it can be distinguished from that species by the greatly reduced webs between the fingers. From young *H. rosenbergi* it differs in having dark markings in the groin and on the thighs, a smaller tympanum, and a well-developed dermal spur. From *H. geographica* and young *H. maxima*, which it closely resembles, it can be distinguished by the absence of palpebral reticulations.

Description.—CNHM 81333, an adult female from Río Guapaya, Serranía de La Macarena, Meta, Colombia. Vomerine teeth in two heavy series, lying close together between the large, oblong choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border fused and with but a trace of a notch. Snout large, somewhat pointed when viewed from above, rounded in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis slightly defined; loreal region concave and oblique, the upper lip flaring out below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is in turn slightly greater than distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance about equal to one-third its own diameter. Fingers with a trace of web at base, fourth finger considerably longer than second, just reaching to disk of third which covers about two-thirds the tympanic area; no projecting rudiment of a pollex; a distinct but not conspicuous ulnar ridge. Toes slightly more than one-third webbed, the web on fourth toe not quite reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner but no distinct rounded outer metatarsal tubercle; tarsal ridge small but distinct, a very distinct, elongate dermal appendage on heel. Body somewhat elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; no trace of a skinfold across chest; no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 48.2 mm.; head length, 17.6 mm.; head width, 17.6 mm.; femur, 25.4 mm.; tibia, 28.8 mm.; heel-to-toe, 35.5 mm.; hand, 14.3 mm.

Color in alcohol.—Light brown above, yellowish gray below. A narrow dark stripe lies on each canthus, and a similar stripe originates at tip of snout and passes posteriorly between the eyes and fades out above the tympanum. The posterior part of side, anterior and posterior faces of thigh, and inner face of shank heavily marbled with black. Immaculate below.

Remarks.—Several workers (Boulenger, 1882, p. 359; Nieden, 1923, p. 306; Crawford, 1931, p. 34) have synonymized *Hyla fasciata* Günther and *Hyla calcarata* Troschel. While there can be no doubt that these are closely related forms, we do not believe they may be appropriately synonymized. A study of the type of *fasciata* (BM 58.7.25.22) shows that it differs from the specimens of *calcarata* at hand as follows: the canthus rostralis more strongly defined; loreal region much less oblique; tympanum only one-third rather than one-half the diameter of eye; digital disk of third finger covers entire tympanum instead of only two-thirds of it; web on fourth toe extends to distal third of penultimate phalanx instead of failing to reach the penultimate phalanx; dermal appendage on heel short and triangular instead of long and spur-like, It seems to us that these differences are too significant to permit synonymizing the two forms.

While we have not examined very much material, from specimens we have seen it appears likely that *calcarata* is a lowland form ranging from the Guianas to the eastern slopes of the Andes, while *fasciata* is a more montane form occurring in the Andes proper. Whether the two are simply geographic races of a single species cannot be determined until additional material has been studied.

Lutz and Kloss (1952, p. 647) report that their specimen from Benjamin Constant, Brazil, was found between two bromeliad leaves on a fallen tree. This locality is just across the river from Leticia, Colombia.

Specimens Examined

COLOMBIA

Caquetá: Río Mecaya, CNHM 69715.

Meta: Serranía de La Macarena, CNHM 81333–4; Villavicencio, CJG 2353.

Putumayo: Puerto Asís on upper Río Putumayo, USN 152279.

Vichada: Amanavén, USNM 152317.

BRITISH GUIANA: Matanuki River, BM 1936.4.2.35; New River, BM 1939.1.1.61.

ECUADOR: Oriente, Abitagua, USNM 118709; Napo Pastaza, Puyo, JAP 1956.

5. PHANTASMAGORIA group

Very large tree frogs with vomerine teeth in transverse patches, very large, extensively webbed hands and feet, and sacral diapophyses not appreciably expanded. At present, *H. immensa* of Costa Rica is the only other species we know of that is a member of this group.

Hyla phantasmagoria Dunn

PLATE 28A–C

1943. *Hyla phantasmagoria* Dunn, p. 309 (type locality, Colombia, Río Cauca, near border of Antioquia and Bolívar); 1944c, p. 516.—Gorham, 1963, p. 22.

Diagnosis.—An immense *Hyla* with enlarged hands and feet that are extensively webbed and with the cranial derm not co-ossified with the skull.

The large size, large hands and feet, and transverse patches of vomerine teeth of this species serve to distinguish it easily from any other Colombian *Hyla*.

Description.—MLS 267 (holotype) from Río Cauca, near Antioquia-Bolívar border. Vomerine teeth in two long, heavy transverse series, lying close together on a level with the posterior borders of the large, rounded choanae and extending laterally to terminate behind the median third of the choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border fused and with just a hint of a notch. Snout large, broadly U-shaped when viewed from above, truncate in profile, the upper jaw extending slightly beyond lower; nostrils lateral, considerably projecting, their distance from end of snout one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye, Canthus rostralis strongly defined; loreal region concave and somewhat oblique, the upper lip flaring out distinctly below it. Eye large, very prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eye lid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers webbed to disks of second, third, and fourth, to base of penultimate phalanx of first; fourth finger but half a disk longer than second and reaching to middle of disk of third which much exceeds the tympanic area and nearly covers the eye; a pronounced projecting pollex covered with soft flesh; ulnar ridge well developed with scalloped margin. Toes completely webbed to all disks, third and fifth subequal, disk of fourth toe somewhat larger than the tympanic area; a distinct oval inner but no distinct rounded outer metatarsal tubercle; well-developed tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts highly glandular, with prominent, elongate, wart-like tubercles; these tubercles conspicuous on all dorsal surfaces, including the arms and legs with a well-developed patch on each heel; a strongly developed glandular ridge passing above upper part of tympanum and continuing posteriorly to above arm; skin of throat, chest, belly, and lower surface of thigh uniformly and coarsely granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 109.7 mm.; head length, 35.8 mm.; head width, 42 mm.; femur, 50.5 mm.; tibia, 60.3 mm.; heel-to-toe, 84.8 mm.; hand, 41.3 mm.

Color in alcohol.—Above, very dark brown with no discernible pattern although slightly paler above sacral region. Below, somewhat paler than above but still quite dark. On chin and throat the dark brown pigment is in a more or less vermiculated pattern, while on the undersurfaces of thighs it appears as larger blotches that are separated by narrow bands of lighter area. Elsewhere the dark pigment is so concentrated that it leaves no discernible pattern. The general effect is that of a dark, chocolately brown frog with slightly lighter ventral surfaces.

Remarks.—We do not understand how Dunn came to describe this species as having the skin of the head co-ossified with the skull, for we have made a slit in the skull cap and can move a needle completely over the top of the skull without finding any evidence that the skin is fused to it.

Duellman brought the type of *Hyla immensa* Taylor from Costa Rica to Gainesville, Florida, and he and the junior author compared it with the type of *H. phantasmagoria.* The only possible conclusion was that the two species are very closely related. It is very possible that they represent different races of a single species, but we do not wish to make this assignment after examining only two specimens.

6. CARRI group

Large tree frogs with reduced webbing between the fingers and a dorsal pattern of dark blotches bordered with light margins. *H. claresignata* of Brazil apparently belongs in this group.

Hyla carri, new species

FIGURE 19

Holotype.—CNHM 69702, collected at Acevedo, along the Río Suaza, 1,400 meters, in Huila, Colombia.

Diagnosis.—A large *Hyla* with the vomerine teeth in two ⌃ ⌃ shaped patches between the somewhat squarish choanae; reduced webs between the fingers; and a pattern of dorsal dark blotches bordered by light margins.

The species is not similar to any other species known in Colombia. It is perhaps most closely related to *Hyla claresignata* of Brazil, from which it can be differentiated by its more heavily spotted dorsum, larger tympanum, and lack of dark anal spot.

Description of holotype.—Vomerine teeth in two ⌃ ⌃ series, lying close together between the moderate-sized, somewhat squarish choanae; tongue two-thirds as wide as mouth opening, nearly round, its posterior border fused and very shallowly notched. Snout moderate

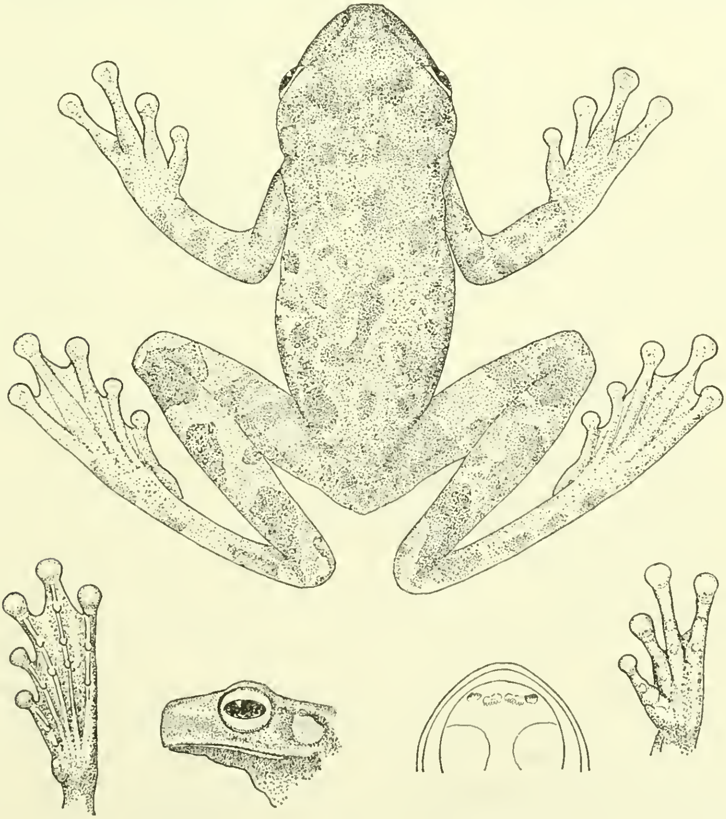

FIGURE 19.—*Hyla carri*, holotype, CNHM 69702 (same size).

somewhat rounded when viewed from above, truncate in profile, the upper jaw not extending appreciably beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval nearly equal their distance from eye. Canthus rostralis well defined; loreal region concave and somewhat oblique, the upper lip flaring out moderately below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is in turn about equal the distance between nostrils. Tympanum very distinct, about two-thirds the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web on third finger reaching middle of antepenultimate phalanx, fourth finger considerably longer than second, reaching to middle of disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes nearly completely webbed, the web on fourth toe reaching the middle of the penultimate phalanx, then continuing as narrow margin to base of disk; third and fifth toes subequal, disk of fourth toe covering about four-fifths the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth; a strongly developed narrow glandular ridge encircling upper part of tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and rather coarsely granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 64.1 mm.; head length, 22 mm.; head width, 23.3 mm.; femur, 33.3 mm.; tibia, 38.5 mm.; heel-to-toe, 50.8 mm.; hand, 22.3 mm.

Color in alcohol.—A moderate brown frog with a dorsal pattern consisting of dark brown blotches. On posterior portion of trunk and on forearms, legs, and feet the dorsal blotches are outlined with a narrow pale margin of tan, but the blotches on anterior portion of trunk and on top of head are smaller than the more posterior ones and are not margined with a lighter tone. Along each side between axilla and groin the ground color is much lighter than elsewhere, a dirty gray, and here there are a number of smaller, rather distinct, black spots. The chin, throat, and chest are fuscous.

Remarks.—The holotype, a gravid female packed with pigmented eggs, is the only individual we have seen of this species, and we know of no specimen from the Andes that resembles it.

We dedicate this new species to our friend Archie Carr in recognition of his contributions to tropical biology and for the help he has given us.

7. BUCKLEYI group

Moderate-sized *Hyla* with well-developed patagia, reduced webbing between the fingers, throat and chest regions dusky to distinctly spotted, and choanae moderate in size and somewhat oblong rather than small and rounded.

The two Colombian species in this group may be distinguished with the aid of the following key:

a^1. Faded mottled pattern on back, throat and chest dusky but not distinctly spotted, fingers webbed only at base . . . . **H. buckleyi**

a^2. Distinctly marked above, throat and chest heavily sprinkled with small distinct spots, fingers about one-half webbed . . . . **H. cabrerai**

Hyla buckleyi Boulenger

PLATE 28D–F

1882. *Hyla buckleyi* Boulenger, 1882a, p. 362 (type locality, here restricted, Ecuador, Canelos).—Nieden, 1923, p. 267.

1961. *Osteocephalus buckleyi.*—Goin, p. 13.

Diagnosis.—A moderate-sized *Hyla* with fairly well-developed patagium; faded mottled pattern on the back; throat and chest dusky but not distinctly spotted; and reduced webbing between the fingers.

H. buckleyi is most closely allied to *cabrerai*, from which it may be distinguished by the reduced webbing between the fingers and the lack of distinct spots on throat and chest.

Description.—CNHM 54765, from Río Rumiyaco, 1,000 meters, Nariño, Colombia. Vomerine teeth in two short ^^ series, lying close together between the moderate-sized, oblong choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border very slightly free and unnotched. Snout moderate, rounded when viewed from above, truncate in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region concave and rather oblique, the upper lip flaring out below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate;

interorbital distance slightly less than width of upper eyelid, which is relatively wide and greater than distance between nostrils. Tympanum very distinct, about three-fourths the diameter of eye, separated from eye by a distance equal to one-fourth its own diameter. Fingers slightly webbed at base, fourth finger considerably longer than second, reaching to middle of disk of third which covers about one-third the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge but several small warts along the posterior edge of foot; no dermal appendage on heel but three definite warts arranged in a triangular position on each heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches just beyond tip of snout; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap considerably. A patagium extends from the back of upper arm to side of the body. Skin of upper parts very finely glandular; a distinct glandular ridge encircling upper part of tympanum; skin of throat and chest fairly smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult female, no vocal sacs. Skin of head not co-ossified with skull, roof of skull very lightly exostosed.

Dimensions.—Head and body, 48.2 mm.; head length, 17.4 mm.; head width, 17.7 mm.; femur, 24.5 mm.; tibia, 27.4 mm.; heel-to-toe, 34.4 mm.; hand, 14 mm.

Color in alcohol.—A dirty brown frog with darker mottled brown blotches on back and side. Each loreal region has a mottled area. There is a large smutty blotch on the back that extends from between the eyes nearly back to the sacral hump. There is a narrow, somewhat transverse smudge above the sacral hump. A series of small blotches are scattered along each side between the axilla and groin. Each thigh and shank is crossed by three rather wide crossbands of dirty brown with less-distinct bands on the feet, arms, and hands. The entire undersurface is a dark cadaverish gray.

Remarks.—The specimen from Nariño (CNHM 54765) was directly compared with the series of cotypes in the British Museum and is found to be conspecific with them. Our notes made at time of comparison are as follows:

> Most of the differences can be laid to differences in preservation. The CNHM specimen has the skin harder and drier while the cotypes have the skin soft and smooth. The CNHM specimen is much darker, but even so, if it is studied care-

fully, it is plain to see that the same basic pattern obtains. Where the cotypes are pale yellow, the CNHM specimen is pale to medium brown, and where the cotypes are brown the Chicago Natural History Museum specimen is nearly black; however, the latter apparently was preserved in too strong formalin, while the cotypes look as though they didn't have quite enough.

Specimens Examined

COLOMBIA
  META: Upper Río Güejar, opposite side from "La Macarena," USNM 152199.
  NARIÑO: Río Rumiyaco, 1,000 m., CNHM 54765.
ECUADOR: Alto Napo, Río Payamino, WCAB 294; Canelos, BM 80.12.5.184–9 (cotypes); Sarayacu, BM 80.12.5.238 (two cotypes); 80.12.5.215–7 (cotypes); Paitanga, 80.12.5.277 (cotype); Pastaza River between Canelos and Marañon, MCZ 19695–6.

***Hyla cabrerai*, new species**

FIGURE 20; PLATE 29A–C

Holotype.—USNM 152759, collected along the Caño Guacayá, a tributary of the lower Río Apaporis, Amazonas, Colombia, by I. Cabrera in May 1952.

Paratypes.—CJG 2317, collected along the Caño Tuí between Mitú and the Raudal de Yuruparí, Vaupés, October 17, 1951 by I. Cabrera, and WCAB 13284, from Amapá Territory, Brazil.

Diagnosis.—A moderate-sized *Hyla* with a patagium, a distinct pattern on the back, throat and chest heavily sprinkled with small but distinct dark brown spots, and the fingers about one-half webbed.

H. cabrerai is most closely allied to *H. buckleyi*, from which it differs in having chest and throat spotted and a greater amount of webbing between the fingers.

Description of holotype.—Vomerine teeth in two moderate, slightly arched series, lying between the moderate-sized, oblong choanae; tongue three-fourths as wide as mouth opening, broadly ovate, its posterior border but slightly free and unnotched. Snout moderate, rounded when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region concave and oblique, the upper lip flaring out below it. Eye moderate, not particularly prominent, its diameter nearly equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about three-fourths the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers one-half webbed, fourth finger considerably longer than second, reaching to middle of disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; ulnar ridge present but somewhat indistinct. Toes webbed, the web on fourth toe reaching base of the disk, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a row of conical, soft, wartlike structures along the tarsal ridge; a small dermal appendage on heel. Body somewhat elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee reaches nearly to axilla; when hind legs are bent at right angles to body, heels overlap greatly. A small patagium extends from the back of upper arm to side of body. Skin of upper parts glandular, with wart-like tubercles arising from various areas in which the glandules of the skin appear particularly concentrated, these tubercles particularly conspicuous on snout, including loreal and canthal regions, on upper eyelids and occiput, and around anus; a distinct narrow glandular ridge encircling upper part of tympanum; skin of throat and chest nearly smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a

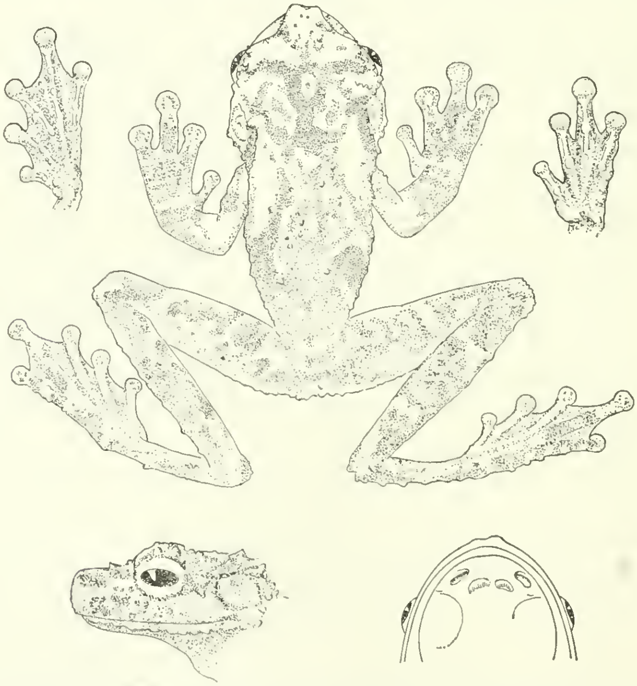

Figure 20.—*Hyla cabrerai*, holotype, USNM 152759 (same size, except head profile and mouthparts, which are × 1.3). See also Plate 29 a–c.

skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 52.7 mm.; head length, 19.2 mm.; head width, 19.2 mm.; femur, 27.2 mm.; tibia, 31.8 mm.; heel-to-toe, 38.5 mm.; hand, 17.1 mm.

Color in alcohol.—A rather brilliantly marked black and yellow frog. The general ground color seems to be a pale yellow with a black pattern as follows: a few tiny blotches along margin of upper lip; a blotch on each canthal region; a narrow interocular bar with a median, posterior projecting portion that passes back to the occipital region; a line along the supratympanic ridges; a pair of straight, posteriorly diverging lines in the suprascapular region; a somewhat enlarged blotch on each sacral protuberance that extends to the groin on each side; three broad, narrowly separated crossbands on each thigh, shank, and foot; a single broad crossband on each upper arm, forearm, and hand; chin, throat, and breast with numerous distinct, discrete spots, each about the diameter of a pin head.

Remarks.—The three specimens at hand (holotype and two paratypes) are rather uniform in both structure and pattern. The specimen from Amapá, Brazil, has a little less webbing between the fingers than the other two but the difference is so slight that it seems insignificant.

This species, together with *buckleyi* and *pearsoni* certainly make a closely knit group. We have examined the type series of *buckleyi* in detail and have seen (but have not examined in detail) the type of *pearsoni.* Both *buckleyi* and *cabrerai,* have long hind legs, with the extended heel reaching to the tip of the snout, while in *pearsoni* the extended heel reaches only to the eye. *H. buckleyi* has the belly dusky, while it is heavily spotted in *cabrerari* and is reticulated in *pearsoni. H. cabrerai* seems to have the heaviest hands with the most webbing between the fingers; the other two species have the webbing reduced between the fingers.

This species is dedicated to our friend Sr. Isadore Cabrera, collector of the type, who was trained in the field by Prof. R. E. Schultes of Harvard and who has contributed appreciably to the knowledge of his native country by both his botanical and his zoological collections.

8. ALBOMARGINATA group

Moderate-sized, pale tree frogs (pale to white in preservative) with patagia and well-developed ulnar and tarsal ridges, a triangular dermal appendage on the heel, and a transverse glandular ridge above the vent. The species that are known from life have pink or or red webs between the fingers and toes. In addition to *H. albo-*

marginata and *H. albopunctulata* of Colombia, *H. rufitela* of Panama also is a member of this group.

The two species known from Colombia may be separated by the following key:

a^1. Tympanum about one-fourth the diameter of eye; vomerine teeth in two small transverse series . . . . **H. albpunctulata**

a^2. Tympanum about one-half the diameter of eye; vomerine teeth in two moderate-sized, somewhat arched series . . . . **H. albomarginata**

Hyla albomarginata Spix

PLATE 29F–H

1824. *Hyla albomarginata* Spix, p. 33, pl. 8, fig. 1 (type locality, Bahia).—Tschudi, 1838, p. 72.—Duméril and Bibron, 1841, p. 555.—Günther, 1858, p. 98; 1901, p. 284.—Reinhardt, and Lütken 1862, p. 186.—Steindachner, 1867, p. 57.—Cunningham, 1871, p. 468.—Peters, 1872a, p. 771.—F. Müller, 1882a, p. 140.—Boulenger, 1882a, p. 356; 1900, p. 56.—Werner, 1897, p. 220.—Wandolleck, 1907, p. 13.—Baumann, 1912, p. 101; 1917, pp. 132, 143.—Beebe, 1919, p. 207; 1925, p. 124.—Nieden, 1923, p. 260.—Miranda-Ribeiro, 1926, p. 74.—Mertens, 1926, p. 4; 1928, p. 298; 1930, p. 162; 1950, p. 174.—A. Lutz, 1927, pp. 38, 43.—Ahl, 1931, p. 2 (separate), fig.—Crawford, 1931, p. 33.—Parker, 1935, p. 511.—Myers, 1946, pp. 13, 31.—B. Lutz, 1949, p. 555, fig. 2.—Cochran, 1955, p. 164.—Fouquette, 1961, p. 595.

1824. *Hyla cinerascens* Spix, p. 35, pl. 8, fig. 4 (type locality, Ecga [Ega], on the Solimões.

1824. *Hyla infulata* Wied, p. 671 (type locality not given); 1825, p. 533.—Burmeister, 1856, p. 97, pl. 30, figs. 1–6.

1830. *Hypsiboas albomarginatus.*—Wagler, 1830, p. 201.—Fitzinger, 1843, p. 30.—Cope, 1886, p. 273.

1860. *Phyllobius albomarginatus.*—Fitzinger, 1860, p. 412.

1860. *Phyllobius exanthematicus* Fitzinger, p. 413.

1930. *Hyla massarti* De Witte, 1930, p. 225 (type locality, Botanical Gardens, city of Rio de Janeiro).

Diagnosis.—A Hyla with ulnar and tarsal ridges, a small, triangular dermal appendage on heel, and practically no dorsal pattern (nearly pure white in preservative but with bright pink webbing on hands and feet in life).

The nearly pure white dorsum in combination with ulnar and tarsal ridges and dermal heel appendages set *H. albomerginata* apart from all Colombian frogs except *H. albopunctulata*, from which it differs in its larger tympanum and more strongly developed vomerine teeth.

Description.—CJG 2354, from Zetaquirá, near Miraflores, Boyacá, Colombia. Vomerine teeth in two somewhat arched series, lying close together just slightly behind the posterior borders of the moderate-sized, rounded choanae; tongue three-fifths as wide as mouth opening, broadly rounded, its posterior border fused and somewhat truncate but unnotched. Snout moderate, rounded when viewed from above, slightly sloping in profile, the upper jaw hardly extending beyond lower; nostrils more lateral than superior and more anterior than lateral, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis slightly defined; loreal region somewhat concave and oblique, the upper lip flaring out slightly below it. Eye not large, but prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance half again the width of upper eyelid, which is about equal the distance between nostrils. Tympanum distinct but not very prominent, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base, fourth finger longer than second, just reaching to disk of third which about covers the tympanic area; no projecting rudiment of a pollex; a distinct ulnar ridge. Toes nearly completely webbed, the web on fourth toe reaching the middle of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a distinct tarsal ridge; a small but distinct triangular dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap greatly. A small patagium extends from the back of the upper arm to the side of the body. A transverse dermal fold above vent. Skin of upper parts smooth, skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; no apparent traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 40.6 mm.; head length, 13.0 mm.; head width, 12.5 mm.; femur, 19.7 mm.; tibia, 21.2 mm.; heel-to-toe, 28.5 mm.; hand, 13.4 mm.

Color in alcohol.—Practically white with a pattern of black pigment as follows: scattered, inconspicuous, tiny black spots on dorsum and top of head; each naris margined in black; a very narrow black line margins the upper lip back to a level between the naris and eye on each side; the transverse fold above the vent, tarsal ridges, and dermal appendages on heels are milky white above and black below; the ulnar ridges are milky white with interrupted black lines.

Remarks.—Although *H. albomarginata* has been previously recorded from Colombia (Cochran, 1955 p. 168), Fouquette (1961 p. 600) pointed out that the specimens on which the Colombian records are based were small, poorly preserved specimens that are not conspecific with either *H. rufitela* of Panama or *H. albomarginata* of eastern South America, as defined by him. Re-examination of the specimens mentioned above convinces us that they should not be identified as *albomarginata* and that the only unquestioned Colombian record is the specimen described above from Boyacá.

There seems little doubt that *albopunctulata* is a representative of this group west of the Andes, *rufitela* a representative in Panama, and *albomarginata* a representative east of the Andes. The specimen described above differs from the examples from eastern Brazil in the amount of webbing on the hands and amount of dorsal pigmentation, and it may be that when adequate material becomes available it will prove to be distinct from *albomarginata*.

Specimens Examined

COLOMBIA

Boyacá: Zetaquirá, near Miraflores, CJG 235.4

BRAZIL: Rio de Janeiro, D. F., MZUM 104143 (10), 104144 (2), 104145; Rio de Janeiro, Barro Branco, MZUM 104146 (3).

Hyla albopunctulata **Boulenger**

PLATE 29D,E

1882. *Hyla albopunctulata* Boulenger, 1882a, p. 385 (type locality, Ecuador, Sarayacu).—Nieden, 1923, p. 271.—Gorham, 1963, p. 21.

1908. *Hyla palmeri* Boulenger, p. 515 (type locality, southwestern Colombia, Jiménez).—Nieden, 1923, p. 264.—Gorham, 1963, p. 21.—Rivero, 1964a, p. 303.

Diagnosis.—A moderate-sized, somewhat granular *Hyla* characterized by having ulnar and tarsal folds along the arms and feet respectively, a wavy glandular fold over the vent, and a short transverse vomerine series lying slightly behind the small rounded choanae. Perhaps it is most closely allied to *Hyla albomarginata*, from which it differs by its smaller tympanum and smaller vomerine teeth.

Description.—BM 1908.5.29.68 [1947.2.13.32] (a cotype of *palmeri*), from Jiménez, Valle, Colombia. Vomerine teeth in two small, transverse series lying close together and just behind a line connecting posterior margins of the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, wider than long, its posterior border fused and very shallowly notched; snout moderate, somewhat rounded when viewed from above, truncate in profile, the upper jaw extending slightly beyond lower; nostril more lateral than superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis slightly defined; loreal region slightly concave and somewhat oblique, the upper lip flaring somewhat below it. Eye moderate, not prominent, its diameter slightly greater than its distance from nostril; interorbital distance half again as wide as upper eyelid, which is relatively wide, and about equivalent to distance between nostrils. Tympanum distinct, small, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers one-third webbed, fourth finger but slightly longer than second, just reaching to disk of third which is half again as broad as the tympanic area; no projecting rudiment of a pollex; a well-developed fold from the elbow along the ulnar side of the arm to the wrist. Toes about three-fourths webbed, the web on fourth toe reaching base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering the tympanic area; metatarsal tubercles not distinct; a very distinct tarsal fold continuing to the heel where it terminates in a small but distinct triangular appendage, tarsal fold somewhat whitish in color, a similar fold above vent, which makes contact with that on leg when limbs are folded; and on each side, anterior to groin, is a little fold which seems to be a structural feature. Body not elongate, in postaxillary region about equal to greatest width of head; when hind leg is adpressed, heel reaches between eye and nostril; when limbs are laid along the side, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap slightly. A patagium extends from the back of the upper arm to the side of the body. Skin of upper parts very finely granular; a quite distinct but rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest finely granular, that of belly and lower thigh uniformly and finely granular; traces of a skinfold across the chest; no inguinal gland; no apparent vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 41.5 mm.; head length, 13.8 mm.; head width, 14 mm.; femur, 20.1 mm.; tibia, 21.7 mm.; foot, 29.5 mm.; hand, 13.5 mm.

Color in alcohol.—A faded yellow all over except for scattered, brownish, pepper-like markings on middle of back.

Remarks.—Although the large cotype of *palmeri* is firm and exceedingly well preserved while the cotypes of *albopunctulata* are quite soft and flabby, it is evident that they all are the same species. The reason for the name is evident, for in one of the cotypes of *albopunctulata* the entire dorsal surface, including that of the limbs, is well-marked with scattered, clear white spots about the size of a pencil dot. A few white spots can be seen on two of the other cotypes, but the cotypes of *palmeri* (BM 1908.5.29.68–9 [1947.2.13.32–3]), the cotype of *albopunctulata* from Sarayacu (BM 80.12.5.230) and another one (80.12.5.-159) from "Ecuador" lack these white punctulations. In all the specimens, what little brown pigment is present tends to be concentrated anteriorly on the back and on top of the head.

Specimens Examined

COLOMBIA

Valle: Jiménez, BM 1908.5.29.68–9 [1947.2.13.32–3] (cotypes of *palmeri*).

ECUADOR: Sarayacu, BM 80.12.5.230 (cotype of *albopunctulata*); no particular locality, BM 80.12.5.159–62 (cotypes of *albopunctulata*).

9. PUNCTATA group

Moderately small green tree frogs with small vomerine tooth patches, reduced webbing between the fingers, without spines on the pollex, and without ulnar or tarsal ridges. It is not now known just how many South American species are in this group, but four now known from Colombia may be distinguished with the aid of the key.

Key to Colombian Species in the PUNCTATA Group

a^1. Red spots or flecks on the dorsum.
  b^1. Dorsal spots minute flecks rather than rounded spots; tympanum about two-thirds the diameter of eye . . . . **H. rubeola**
  b^2. Dorsal spots discrete rounded spots rather than minute flecks; tympanum only about three-fifths the diameter of eye . . . . **H. punctata**
a^2. Dorsum without distinct red markings.
  b^1. Vomerine teeth in two small, rounded patches . . . . . . **H. rhodoporus**
  b^2. Vomerine teeth in two somewhat arched series . . . . **Hyla sp.**

Hyla punctata (Schneider)

Plate 24d–f

1799. *Calamita punctata* Schneider, p. 170 (type locality, "America").

1802. *Hyla punctata*.—Daudin, 1802, p. 41; 1803, p. 81.—Gravenhorst, 1829, p. 30.—Duméril and Bibron, 1841, p. 552.—Burmeister, 1856, p. 101.—Günther, 1858, p. 101; 1872, p. 662.—Peters, 1871, p. 403; 1872a, p. 771; 1873a, p. 208.—Boulenger, 1880, p. 48; 1882a, p. 357; 1889, p. 247; 1898a, p. 126.—Boettger, 1892, p. 40.—Berg, 1896, p. 207.—Peracca, 1904, pp. 13, 37.—Baumann, 1912, p. 163.—Beebe, 1919, p. 207; 1952, p. 174.—Nieden, 1923, p. 307.—Miranda-Ribeiro, 1926, p. 88; 1937a, p. 56.—A. Lutz, 1927, p.40.—Parker, 1933, p. 4.—Liu, 1935, p. 34.—B. Lutz, 1951a, p. 303.—Goin, 1958, p. 120.—Goin and Layne, 1958, p. 105.—Gorham, 1963, p. 23.—Rivero, 1964a, p. 301.

1824. *Hyla variolosa* Spix, p. 37 (type locality, woods along Amazon River).—B. Lutz, 1951a, p. 303.

1830. *Auletris variolosa*.—Wagler, 1830, p. 201.

1830. *Scinax variolosa*.—Wagler, 1830, p. 201.

1843. *Hypsiboas punctatus*.—Fitzinger, 1843, p. 30.—Cope, 1867, p. 201; 1871a, p. 554; 1874b, p. 121.

1922. *Hylella pearsei* Ruthven, p. 57 (type locality, Colombia, Magdalena, Santa Marta Mts., Fundación).

1933. *Hyla granosa*.—Crawford and Jones, 1933, p. 90.

1941. *Hyla granosa gracilis* Melin, p. 21.

Diagnosis.—A small "green" frog with greatly reduced webbing between the fingers and with small patches of vomerine teeth.

Hyla punctata may be distinguished from *rubeola* by having rounded red spots (rather than tiny flecks of red) on the back and by its more sturdy build. It may be distinguished from *rhodoporus* by having the tympanum equal to about three-fifths (rather than two-thirds to three-fourths) the diameter of eye and by the presence of rounded red spots on the dorsum.

Description.—UF 8518-1, from Leticia, Amazonas, Colombia. Vomerine teeth in two short, rounded patches, lying close together between the moderate-sized, rounded choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border slightly free and shallowly notched. Snout moderate, U-shaped when viewed from above, truncate in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, somewhat projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis fairly well defined; loreal region a little concave and somewhat oblique, the upper lip flaring out moderately below it. Eye not large, but prominent, its black choroid coat standing out sharply against the pale yellow skin; its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance, upper eyelid, and distance between nostrils about equal. Tympanum distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers with but a trace of web at base, fourth finger considerably longer than second, just reaching to disk of third which covers about two-thirds the tympanic area; no projecting rudiment of a pollex; a low ulnar ridge. Toes slightly less than one-half webbed, the web on fourth toe reaching to middle of antepenultimate phalanx on the lateral side and to its base on the medial side, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller, low, indistinct, rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels do not quite meet. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and not so finely granular; traces of a skinfold across chest; adult male, vocal sac not apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 35.7 mm.; head length, 12.5 mm.; head width, 12.5 mm.; femur, 20.9 mm.; tibia, 18.9 mm.; heel-to-toe, 25.5 mm.; hand, 10.9 mm.

Color in alcohol.—A yellowish ground color with rather distinct scattered white spots dorsally. The dorsal white spots, about one millimeter in diameter, are scattered over the top of head and dorsum. A very narrow, indistinct white stripe originates on each side just posterior to tympanum and terminates just anterior to groin. The ventral surfaces are yellow, the belly being more brownish yellow than the rest.

Remarks.—The series of fresh specimens at hand from Leticia were compared with a cotype of *H. granosa gracilis* Melin, and, as far as we could determine from the preserved specimens, they are conspecific. We also examined the type of *Hylella pearsei* Ruthven (MZUM 54639), and it appears to be an immature specimen of *H. punctata.*

As Dr. Lutz points out (B. Lutz, 1951a), the species of allied "green Hylas" are a "difficult group," and as yet no one has had the opportunity to study all of the group's various forms in life. This is particularly true in the northern Amazon basin, where there seem to be a number of distinct but closely related forms and an even greater number of available names.

Variation.—H. punctata, as now understood, seems to be rather uniform over a rather extensive range. The differences between the series from Leticia in Amazonas, Colombia, and the series from Trinidad are no more than one would expect between two series collected and preserved by two different collectors at two different times. The main difference discernible in any series of specimens of *punctata* that we have seen is in the degree of spotting on the back. Some specimens have no apparent spots on the dorsum; others are quite distinctly spotted. This difference surely is due in part to the time the various specimens have been preserved, but it may be due in part also to the hour of day when the specimens were preserved. Some individuals at night are nearly a uniform rusty red dorsally, and the same individuals, if kept alive, at daylight, will have faded to greenish brown dorsally with distinct yellowish spots.

Specimens Examined

COLOMBIA
Amazonas: Leticia, UF 8517, 8518 (6), 8519–20.
Magdalena: Sierra Nevada de Santa Marta, Fundación, MZUM 54639 (type of *Hylella pearsei*).
Meta: Near Villavicencio, USNM 151944–5.
BRAZIL: Upper Río Vaupés, NM 41-7893 ex. 467 (type of *H. granosa gracilis*).
TRINIDAD: UF 3647, 7300 (8), 7727 (2), 10986 (2), 10987–8.

Hyla rubeola, new species

PLATE 30A–C

Holotype.—USNM 152751, collected on Serranía de La Macarena, Meta, Colombia, January 4, 1959, by F. Medem.

Diagnosis.—This new species, a member of the "green" *Hyla* group, is allied to *punctata* and *rhodoporus*. It is characterized by having a small tympanum set close to the eye, greatly reduced webbing on the fingers, and (in life) bright red, narrow, dorsolateral stripes and scattered pepper-like spots of bright red on the back.

It may be differentiated from *punctata* by having the red dorsal markings as minute red flecks rather than as distinct rounded spots, the tympanum separated from the eye by a distance equal to only one fourth its own diameter, and a more slender build. From *H. rhodoporus* it differs in its more slender build and the presence of dorsolateral red stripes and the tiny fleck-like red specks on the back.

Description of holotype.—Vomerine teeth in two series, lying close together between the moderate-sized, oblong choanae; tongue one-half as wide as mouth opening, broadly triangular, its posterior border truncate and not at all free. Snout moderate, U-shaped when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils nearly lateral, considerably projecting, their distance from end of snout about one-fourth that from eye, separated from each other by an interval equal to about one-half their distance from eye. Canthus rostralis strongly defined; loreal region somewhat concave and oblique, the upper lip flaring out below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to one-fourth its own diameter. Fingers with but a trace of web at base, fourth finger considerably longer than second, just reaching to disk of third which covers about one-fourth the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes less than one-half webbed, the web on fourth toe reaching base of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-sixth the tympanic area; a distinct oval inner and an equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches slightly beyond tip of snout; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels fail to meet. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge passing above upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; no traces of a skinfold across chest; subadult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 33 mm.; head length, 10.9 mm.; head width, 10.6 mm.; femur, 17.7 mm.; tibia, 17.4 mm.; heel-to-toe, 21.8 mm.; hand, 9.4 mm.

Color in alcohol.—Clear pale yellow above and below with a distinct pattern dorsally of small red spots and stripes. A distinct but quite narrow red stripe originates on each side above tympanum and passes posteriorly to region of the sacral hump where it fades out. On top of head and back and on the dorsal surfaces of forearms, thighs, and shanks are scattered tiny but distinct cardinal red spots. There are two such spots on top of head, two on each forearm, three on right thigh, two on left thigh, four on right shank, five on left shank, and sixteen scattered over the back. Except for these red markings, the entire specimen is clear, pale yellow.

Remarks.—This frog seems to be another of the species endemic of Serranía de La Macarena.

After several years in preservative the type has faded to a pallid yellow and might be taken at a glance for some of the other "green" *Hyla* from northern South America, although careful inspection will demonstrate its definitive characters of a small tympanum and the greatly reduced webbing. We did not see the specimen alive but while still fresh it was spectacularly colored with its brilliant red dorsolateral stripes and with the dorsal surfaces flecked with bright red as though someone had sprinkled it with cayenne pepper.

Hyla rhodoporus Günther

PLATE 30D–F

1869. *Hyla rhodoporus* Günther, p. 480 (type locality, Upper Amazons); 1872, p. 662.—Peters, 1871, p. 403.—Boulenger, 1882a, p. 357.—Nieden, 1923, p. 307.—B. Lutz, 1951a, p. 313.—Lutz and Kloss, 1952, p. 653.

Diagnosis.—A small "green" *Hyla* with greatly reduced webbing between the fingers, with small patches of vomerine teeth.

H. rhodoporus may be distinguished from *rubeola* by its sturdier build and the absence of dorsolateral stripes. It differs from *punctata* by having the tympanum equal to about three-fourths (rather than one-half to three-fifths) the diameter of the eye.

Description.—CNHM 81786, Villavicencio, Meta, Colombia. Vomerine teeth in two short, somewhat rounded patches, lying close together between the moderate-sized, rather oblong choanae; tongue one-half as wide as mouth opening, broader than long, its posterior border fused and unnotched. Snout not large, U-shaped when viewed from above, rather truncate in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, somewhat projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis rather well defined; loreal region slightly concave and rather oblique, the upper lip flaring out appreciably below it. Eye not large but prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance, width of upper eyelid, and distance between nostrils about equal. Tympanum very distinct, about four-fifths the diameter of eye, separated from eye by a distance equal to one-fourth its own diameter. Fingers webbed at base, web of third finger reaching base of antepenultimate phalanx, fourth finger but little longer than second, not quite reaching to disk of third which covers about two-thirds of tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes less than one-half webbed, the web on fourth toe reaching base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner and a smaller rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow considerably overlap. When hind legs are bent at right angles to body, heels just snugly touch. No patagium. Skin of upper parts very finely glandular; a narrow glandular ridge passing above tympanum; skin of throat and chest finely granular, that of belly and lower surface of thigh more coarsely granular; just a hint of a skinfold across chest; adult male, vocal sac subgular. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 37.3 mm.; head length, 13 mm.; head width, 13.8 mm.; femur, 18.3 mm.; tibia, 18.8 mm.; heel-to-toe, 26.5 mm.; hand, 10 mm.

Color in alcohol.—This specimen is a uniform yellowish tan above and below without vestige of a pattern. The dark choroid coat of the eye shows through the yellowish, somewhat transluscent upper eyelids.

Variation.—The only variations discernible in the series at hand seem to be results of preservation and the ages of the various specimens.

Remarks.—H. rhodoporus was considered a synonym of *H. punctata* until B. Lutz (1949, p. 313) pointed out in her synopsis of the "green" *Hyla* that it probably was a valid species. Geographically, *rhodoporus* seems to be a species of the eastern slopes of the Andes, while *punctata* is a species of the lowlands. The possibility exists that *rhodoporus* may represent a race of *punctata*.

When the above-described specimen was directly compared with the type it was found to differ only in being a little more robust. The type seems to be a little more dried-out than the described specimen, for its toes and the webbing between them are a little more shrunken. Very faint traces of light dots are still discernible on the back of the type.

When compared directly with *punctata*, the species *rhodoporus* is seen to differ in having a broader head and more rounded snout; in having a larger tympanum (two-thirds to three-fourths the diameter of the eye, while the tympanum of *punctata* is only about one-half the diameter of the eye), and in being less conspicuously spotted.

Specimens Examined

COLOMBIA

Caquetá: Florencia, USNM 152069–71.

Meta: Villavicencio, CNHM 60444, 81783, 81785–6, USNM 152112–4, 152230–46.

Putamayo: Puerto Asís, USNM 152280–1.

"UPPER AMAZONS": BM 66.9.26.4 [1947.2.23.5] (type of *rhodoporus*).

***Hyla* sp.**

A single specimen (USNM 117511) from Río Guaimaral, Atlántico, we prefer to leave without a name. Its reduced webbing and build seem to align it with the "green" *Hyla* group, but it is certainly different from the three species of that group presently recognized from Colombia—*punctata*, *rubeola*, and *rhodoporus*. In general it seems more like *albomarginata*, and the fact that its vomerine tooth rows are somewhat arched would seem to indicate that it might be allied to that species. On the other hand, its tympanum is relatively larger than that of *albomarginata* as redefined by Fouquette (1961, p. 595); it also differs from that species in lacking a super-anal white line, white bars on the heels, and a white ulnar ridge and white line on the tarsus; furthermore, it has greatly reduced webbing on the fingers, and in this respect it is less similar to *albomarginata* than it is to the other species mentioned above. Since the specimen is faded and has been preserved for quite some time, we prefer to hold specific identification in abeyance until fresh material from the north coast of Colombia becomes available.

10. GRANOSA group

Medium-sized green *Hyla* in which the male bears a protruding spine on the pollex; with the vomerine teeth in rather heavy, arched series. The three species now known from Colombia may be differentiated by the following key:

a^1. No dermal appendage on heel.
  b^1. Dorsolateral stripes present . . . . **H. rubracyla**
  b^2. No dorsolateral stripes . . . . **H. granosa**
a^2. A triangular dermal appendage on the heels . . . . **H. guibei**

Hyla rubracyla, new species

FIGURE 21

Holotype.—USNM 157820, collected along the Río Calima, near Córdoba, Valle, Colombia, July 12, 1961, by Fred Medem and Coleman J. Goin.

Paratype.—CNHM 81922, collected at Aqua Clara, Chocó, Colombia.

Diagnosis.—A medium-sized green *Hyla* without a transverse white ridge above the vent, without dermal appendages on the heels, and with conspicuous dark canthal and dorsolateral stripes.

The presence of dorsolateral stripes serves to differentiate this new species from *H. granosa,* while the lack of heel appendages distinguishes it from *H. guibei.*

Description of holotype.—Vomerine teeth in two heavy, arched /\ series, lying very close together between the rather large, oblong choanae; tongue one-half as wide as mouth opening, broadly cordi-

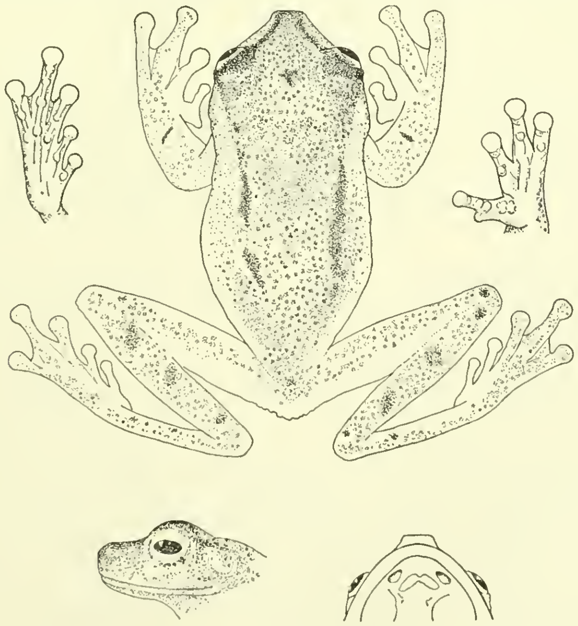

FIGURE 21.—*Hyla rubracyla,* holotype, USNM 157820 (same size).

form, its posterior border very slightly free and shallowly notched. Snout moderate, rounded when viewed from above, truncate in profile, the upper jaw extending a little beyond lower; nostrils lateral, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis strongly defined; loreal region concave and oblique, the upper lip flaring out below it. Eye not particularly large but rather prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum very distinct, about two-thirds the diameter of eye, separated from eye by a distance equal to one-third of its own diameter, Fingers webbed at base, fourth finger longer than second by the diameter of a disk, reaching to disk of third which covers about two-thirds the tympanic area; a spiny projecting pollex, a low ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts very smooth; no transverse glandular white ridge above vent; a rather narrow glandular ridge passing above tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and a little more coarsely granular; no traces of a skinfold across chest. Adult or subadult male, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 50.4 mm.; head length, 18.8 mm.; head width, 19.7 mm.; femur, 28.1 mm.; tibia, 28.7 mm.; heel-to-toe, 37.2 mm.; hand, 15.5 mm.

Color in alcohol.—Ground color white. A conspicuous, very dark reddish brown bar between the nostrils which continues back along the canthus rostralis and along the outer margin of upper eyelid. Interrupted, less-conspicuous dorsolateral stripes of the same color; an interocular dark spot. Each shank marked above with three distinct narrow, dark spots, and a much smaller dark spot on dorsal surface of each thigh just above knee and one across dorsal surface of forearm. Elsewhere the dorsal surfaces are peppered with little rounded specks, these being thickest on top of head and dorsum, less so on sides of face and along sides below dorsolateral dark stripes. These pepper-like specks occur on dorsal surface of forearm, on outer side of hand, and on top of the two outer fingers. They also occur in a narrow band along the dorsal surface of thigh, along the top of the shank, along outer margin of foot, and on top of the three lateral toes.

Color in life.—When collected at night, the type was conspicuously pale, with the pattern in dark red standing out prominently. In daylight, the next morning, its ground color had become a pale, orange-tinted yellow, and the canthal and dorsolateral stripes and spots on the legs were very dark red.

Variation.—The paratype is a spent, adult female 58.4 millimeters in head-body length. Except for having the pepper-like markings tinier and more sparsely distributed and lacking the little dark marks on each thigh just above the knee, her markings are identical with those of the type. She has been much longer in preservative and the ground color is now a cadaverish tan instead of clear white as it is in the type. The pollex, while palpable, does not penetrate the skin as does that of the male.

Remarks.—The type was collected at night, while the frog was sitting on a vine some six feet from the ground near a small wooded stream. The voice was not heard.

The name refers to the bright red markings on the face.

***Hyla granosa* Boulenger**

PLATE 31A–C

1882. *Hyla granosa* Boulenger, 1882a, p. 358 (type locality, here restricted, British Guiana, Demerara Falls).—Werner, 1897, p. 220.—Beebe, 1919, p. 208.—Nieden, 1923, p. 30.—Noble, 1923(a), p. 291.—Crawford. 1931, p. 33.—Lutz, 1951(a), p. 310.—Rivero, 1961, p. 99; 1964a, p, 301.—Gorham, 1963, p. 22.

Diagnosis.—A pale frog without dermal heel appendages, without a glandular ridge above the vent, and without dorsolateral dark stripes.

The absence of heel appendages differentiates *H. granosa* from *H. guibei*, and the absence of dorsolateral stripes distinguishes it from *H. rubracyla.*

Description.—USNM 152756, from Florencia, Caquetá, Colombia. Vomerine teeth in two /‾\-shaped series, lying close together between the moderate-sized, somewhat elongate choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border fused and shallowly notched. Snout large, broadly U-shaped when viewed from above, slightly rounded in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, moderately projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis fairly well defined; loreal region concave and rather oblique, the upper lip flaring out fairly strongly below it. Eye not large but prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about twice the width of upper eyelid, which is in turn about equal the distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web on third finger extending to middle of the antepenultimate phalanx, fourth finger appreciably longer than second, reaching to disk of third which covers about two-thirds the tympanic area; no projecting rudiment of a pollex; a well-developed ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner but no distinct outer metatarsal tubercle; well-developed outer and inner tarsal ridges; no dermal appendage on heel. Body not elongate, in postaxillary region appreciably narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts highly glandular, the dorsal surfaces of head, body, arms, hands, feet, and legs uniformly and fairly conspicuously granular. Texture of the dorsal skin is somewhat reminiscent of the flesh of a stony pear. A rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 35.2 mm.; head length, 14 mm.; head width, 13.5 mm.; femur, 16.6 mm.; tibia, 18.1 mm.; heel-to-toe, 24.6 mm.; hand, 10.5 mm.

Color in alcohol.—This individual is now a uniform pale grayish brown above and below. There is no sign of any pattern or pigmentation and the only color is the black of the choroid coat of the eye. The black eyes tend to show through the partially translucent upper lids.

Remarks.—Our specimen from Florencia, Caquetá, was compared directly with the series of cotypes in the British Museum, particularly with BM 80.12.5.181 [1947.2.12.99] from Canelos, Ecuador. There seems to be no determinable significant difference in the series and we must consider all of these specimens as conspecific.

On the other hand, when the Caquetá specimen was compared with the type of *Hyla granosa gracilis* several differences were noted. We believe that the latter is a specimen of *Hyla punctata* (*q.v.*) and that the name *gracilis* Melin is a straight synonym of *punctata* Schneider.

Specimens Examined

COLOMBIA
  AMAZONAS: Caño Guacayá, MCZ 28049.
  CAQUETÁ: Florencia, USNM 152756.
  VAUPÉS: Gino-Gojé, Lower Río Apaporis, MCZ 28025–37.
BRAZIL: From interior, BM 74.7.16.5–6 (cotypes); Para Santarem, BM 75.10.22.7–9 (cotypes).
BRITISH GUIANA: Demerara Falls, BM 72.10.16.45 (cotype).
ECUADOR: Canelos, BM 80.12.5.181 [1947.2.12.99] (cotype).
VENEZUELA: La Culebra, Alto Cucunoma, Amazonas, MCZ 27828.

Hyla guibei, new species

FIGURE 22

Holotype.—CNHM 54773 from Pueblorrico-St. Cecilia, 800 meters, Pacific side, Caldas, Colombia.

Paratypes.—CJG 2309, Río Satingo, Nariño, Colombia, collected in 1962 by Gerardo Reichel-Dolmatoff; CJG 2314, east of Tumaco, Río Rosario, Nariño, Colombia, collected in March 1962 by Gerardo Reichel-Dolmatoff.

Diagnosis.—A member of the *granosa* group with a transverse white ridge above the vent and with triangular dermal appendages on the heels.

From *Hyla granosa* this new species can be distinguished by the presence of dermal heel appendages and the ridge above the vent; from *H. rubracyla* it can be distinguished by the absence of dorsolateral dark stripes.

Description of holotype.—Vomerine teeth in two heavy, /¯¯\ series, lying close together on a level with the posterior halves of the moderate-sized, oblong choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border not free and unnotched. Snout moderate, broadly U-shaped when viewed from above, slightly rounded in profile, the upper jaw extending slightly beyond lower; nostrils almost entirely lateral, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined, somewhat curved; loreal region concave and somewhat oblique, the upper lip flaring out moderately below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is about equal distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web on third finger reaching base of penultimate phalanx, fourth finger an entire disk longer than second, reaching to middle of disk of third which more than covers the tympanic area; projecting rudiment of a pollex slightly developed; a low ulnar ridge. Toes nearly completely webbed, the web on fourth toe reaching the middle of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe just snugly covering the tympanic area; a distinct oval inner and a smaller, very indistinct rounded outer metatarsal tubercle; a low but discernible tarsal ridge; a short but distinct triangular dermal appendage on heel. Body moderately elongate, in postaxillary region about two-thirds the greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap considerably. No patagium. Skin of upper parts smooth; a horizontal glandular fold

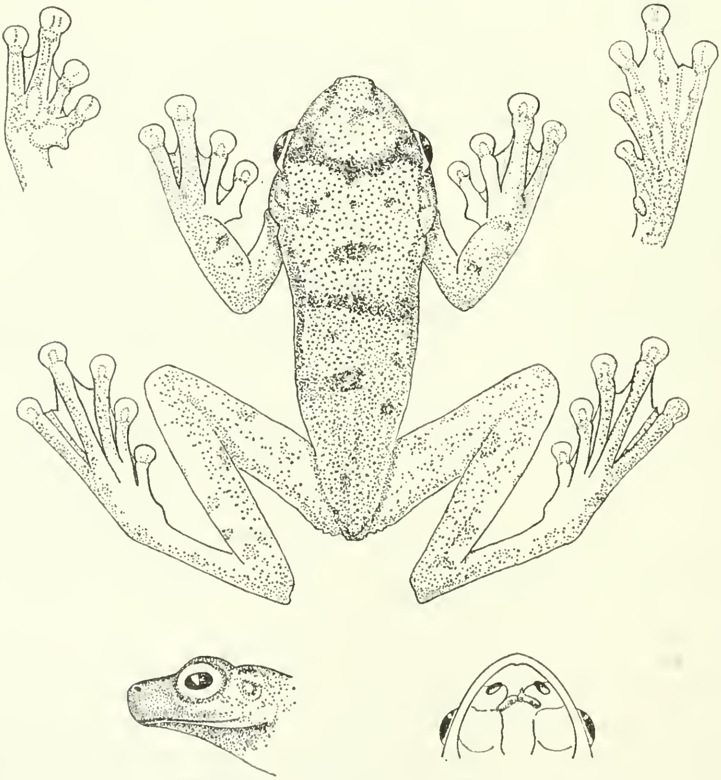

FIGURE 22.—*Hyla guibei*, holotype, CNHM 54773 (same size).

passes above the vent; a distinct narrow glandular ridge passes above tympanum; skin of throat and chest, smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 61.6 mm.; head length, 21.5 mm.; head width, 22 mm.; femur, 30.2 mm.; tibia, 34 mm.; heel-to-toe, 46.1 mm.; hand, 19.6 mm.

Color in alcohol.—A pale frog with the dorsal surfaces thickly flecked with pepper-like dots. In addition to these flecks the pigment is concentrated in the following places to form a pattern: just back of each nostril a little canthal stripe that goes about halfway to eye; a distinct blotch on each upper lid that is joined to the one on the other side by an interocular bar; three dark marks across the back, the most posterior of which is just above the sacrum. The pepper-like fleckings are reduced on top of the thighs to several patches, the thighs otherwise being immaculate. All ventral surfaces are an immaculate dirty gray.

Variation.—The male paratype has the ground color nearly white as compared to the cadaverish gray ground color of the long-preserved type. Its pattern is like that of the type, although the details of the dark spots on the dorsum are not absolutely identical. This specimen is 44.2 millimeters in head-body length and the spiny prepollex penetrates the skin.

The female paratype is 50.6 millimeter in head-body length and is without dark markings except for little patches of dark brown on the heels and a dark line along the lateral margin of the fifth toe. There are tiny, indistinct, faint specks of pigment on the dorsal surface but these are not dense enough to keep the specimen from looking pure white to the naked eye. The dermal appendages on the heels are not nearly so large as those of the type. This female is packed with ripe, pigmented eggs.

It is impossible to tell at the present time if the differences between the female paratype and the type have any systematic significance.

Remarks.—The three specimens at hand surely represent a distinct species in this group of white frogs of the Pacific coast.

We dedicate this new species to Dr. Jean Guibé, director of the Muséum National d'Histoire Naturelle, Paris, in recognition of our gratitude to him.

11. SQUALIROSTRIS group

Members of this group are small *Hyla* with striped patterns, pointed snouts, and shanks having a diameter equal to that of the thighs. *H. linderi* and *H. parkeri* seem to belong in this group. The group is closely related to the *rubra* group but is here kept separate for convenience. Only one species is now known from Colombia, and we refer it to *squalirostris* pending study of additional material.

Hyla squalirostris A. Lutz

FIGURE 23

1925. *Hyla squalirostris* A. Lutz, p. 212 (type locality, marshes of Serra da Bocaina, boundary of Rio de Janeiro and São Paulo); 1926, p. 7, 14.—Cochran, 1955, p. 151.—Gorham, 1963, p. 23.

Diagnosis.—A small, slender frog with long legs and a long pointed snout and longitudinal stripes on the back.

Hyla squalirostris is perhaps more closely related to *H. rubra* than to any other Colombia frog, but its slender build and lack of black and light markings on the rear surface of thigh serve to distinguish it from that species.

Description.—MLS 122, from 20 kilometers west of Cúcuta, Norte de Santander, Colombia. Vomerine teeth in two small rounded series,

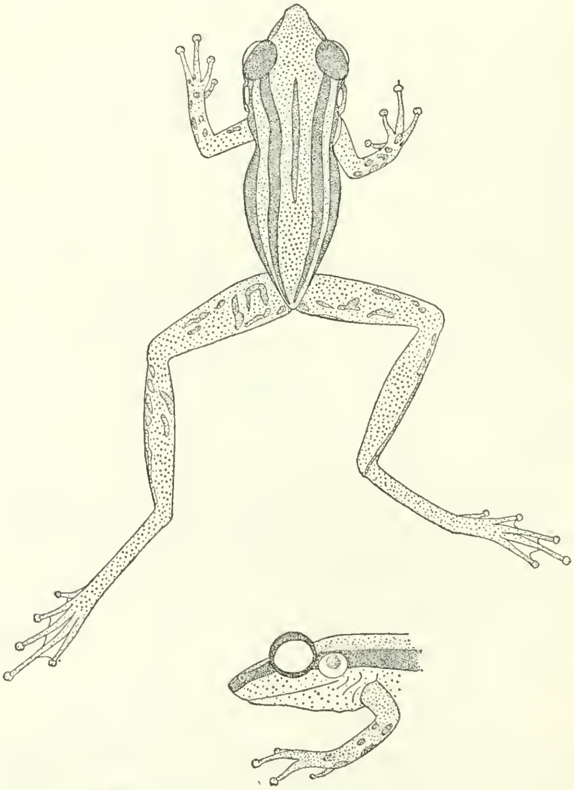

FIGURE 23.—*Hyla squalirostris*, MLS 122 (× 2.5).

lying close together on a level with the posterior borders of the small, rounded choanae; tongue one-half as wide as mouth opening, cordiform, its posterior border very slightly free and very shallowly notched. Snout long, pointed when viewed from above, pointed in profile, the upper jaw extending considerably beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region flat and very nearly vertical, the upper lip not flaring out appreciably below it. Eye moderate in size but prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is relatively narrow and slightly less than distance between nostrils. Tympanum distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-fourth its own diameter. Fingers without webs, fourth finger but slightly longer than second, failing to reach to disk of third by the diameter of a disk; disk of third covers about one-fourth the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes about one-half webbed, the web on fourth toe reaching the middle of the antepenultimate phalanx (webs very delicate and tear at a touch), third and fifth toes subequal, disk of fourth toe covering about one-fifth the tympanic area; a distinct oval inner and a much smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap slightly. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; traces of a skinfold across chest; adult male, vocal sac apparent as subgular wrinkles. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 15.6 mm.; head length, 6.5 mm.; head width, 5.5 mm.; femur, 8 mm.; tibia, 9.9 mm.; heel-to-toe, 12.1 mm.; hand, 4.8 mm.

Color in alcohol.—A dark, striped frog. The dorsum is medium brown with five longitudinal dark stripes as follows: a medium stripe originates between the eyes and terminates posteriorly above the urostyle; a pair of dorsolateral stripes originate one behind each eye and terminate posteriorly to the sacral hump on each side; a pair of lateral stripes originate on the tip of the snout, each passes posteriorly through the nostril, along the canthus rostralis, through lower part of eye, and through the tympanum and terminates in the groin. The edge of the upper lip is pale, as is the side and venter below the lateral stripe.

Remarks.—It bothers our zoogeographic sense somewhat to use the name "*squalirostris*" for this single specimen, for the Serra da Bocaina and the Maracaibo Basin have little in common faunistically; however, our specimen is certainly close to, if not identical with, the Brazilian specimens of the species.

The single specimen at hand seems to differ structurally from the Brazilian specimens only in that the snout is a little shorter and the tympanum a little larger and set a little closer to the eye. It is impossible to judge the significance of these differences, as they are based on comparison of a single specimen with a population about which we know little concerning geographic variation.

There seems to be no doubt that *squalirostris* is allied to *parkeri* Gaige, *evelynae* Schmidt, and *lindneri* Müller and Hellmich and, through them, to the *rubra* group. However, we do not feel that this justifies putting these species in the *rubra* group as at present understood, for it seems probable that such forms as *rubra* and *hayi* are much more closely related, one to the other, than *squalirostris* and *parkeri* are to either of them.

Specimens Examined

COLOMBIA
  NORTE DE SANTANDER: 20 km. west of Cúcuta, MLS 122.
ARGENTINA: Maschwitz, Buenos Aires, MCZ 35421–2.
BRAZIL: Serra da Bocaina (boundary of Rio de Janeiro and São Paulo), USNM 96719–20 (cotypes of *squalirostris*), 96608–13; Bonita, São Paulo, USNM 96721.

12. RUBRA group

At the present time this is one of the most difficult groups among all the South American tree frogs. *H. rubra, sensu latu*, is one of the most widespread and one of the most variable of all South American frogs. Every local population differs in some respects from other local populations, in some cases quite markedly. We have tried to consider all of these geographic variations as simply populations of *rubra* and have restricted nomenclatorial recognition to distinct, sympatric populations that show an obvious relation to *rubra*. The group as a whole is represented by small to medium-sized *Hyla* with reduced webbing between the fingers; vomerine teeth in two small rounded patches; the absence of patagia, ulnar, or tarsal ridges; and by the presence of distinct markings on the posterior surfaces of the thighs. The three species now known from Colombia may be distinguished by the following key:

a 1. Markings on posterior surfaces of thighs in the form of broad, dark, vertical bands.
  b 1. Underside of throat, chin, and rostrum pale . . . . . . **H. boulengeri**
  b 2. Underside of throat, chin, and rostrum dark . . . . . . **H. foliamorta**
a 2. Markings on posterior surfaces of thighs in the form of vermiculations. **H. rubra**

Hyla rubra Daudin

PLATE 31D–F

1802. *Hyla rubra* Daudin, p. 19 (type locality, Suriname); 1803, p. 53.—Burmeister, 1856, p. 109.—Günther, 1858, p. 110.—Reinhart and Lütken, 1862, p. 196.—Steindachner, 1867, p. 60.—Boulenger, 1882a, p. 403; 1884a, p. 638; 1884b, p. 389; 1886a, p. 444; 1888a, p. 40.—Boettger, 1892, p. 45.—Peters, 1892, p. 172.—Berg. 1896, p. 151.—Werner, 1901, p. 602.—Lidth, 1904, p. 94.—Baumann, 1912, p. 108.—Fowler, 1913, p. 156.—Beebe, 1919, p. 208; 1925, p. 122; 1952, p. 174.—Ruthven, 1919, p. 13.—Nieden, 1923, p. 310.—Cott, 1926, p. 1160.—Miranda-Ribeiro, 1926, p. 88; 1937, p. 56.—Lutz, 1927, p. 39.—Barbour and Loveridge, 1929, p. 280.—De Witte, 1930, p. 16.—Crawford, 1931, p. 35.—Dunn, 1931, p. 413.—Crawford and Jones, 1933, p. 91.—Parker, 1933, p. 4; 1935, p. 512; 1939, p. 89.—Liu, 1935, p. 35.—Mello-Leitão, 1937, p. 268.—Carvalho, 1939, p. 280.—Schubart, 1939, p. 51.—Estable, 1942, p. 50.—Frieberg, 1942, p. 226.—Travassas and Frietas, 1942, p. 282.—Andersson, 1945, p. 66.—Schmidt and Inger, 1951, p. 448.—Cei, 1956, p. 61.—Goin, 1958, p. 120.—Goin and Layne, 1958, p. 104.—Stebbins and Hendrickson, 1959, p. 526.—Rivero, 1961, p. 120; 1964b, p. 311.—Gorham, 1963, p. 23.

1820. *Calamita ruber*.—Merrem, 1820, p. 171.—Günther, 1858, p. 110.

1824. *Hyla lateristriga* Spix, p. 32 (type locality not given).—Peters, 1873a, p. 207.

1824. *Hyla affinis* Spix, p. 33 (type locality, Amazonenfluss).—Peters, 1873a, p. 214.

1824. *Hyla coerulea* Spix, p. 37 (type locality, ex Ecga von Solimoens).—Peters, 1873a, p. 218.

1824. *Hyla x-signata* Spix, p. 40 (type locality, Bahia).—Peters, 1873a, p. 218.—Mertens, 1928, p. 299.—Lutz, 1951b, p. 705.

1830. *Auletris coerulea*.—Wagler, 1830, p. 201.

1830. *Auletris rubra*.—Wagler, 1830, p. 201.

1838. *Dendrohyas rubra*.—Tschudi, 1838, p. 74.—Fitzinger, 1860, p. 413.

1841. *Hyla cynocephala* Duméril and Bibron, p. 558 (type locality, "Guyane").—Peters, 1873a, p. 613.—Guibé, 1949, p. 18.

1863. *Hyla conirostris* Peters, 1863b, p. 464 (type locality, Pebas, Peru).—Peters, 1871a, p. 403.

1870. *Scytopis alleni* Cope, p. 162 (type locality, Pará, Brazil); 1870, p. 156 (nomen nudum); 1871b, p. 222; 1874b, p. 123; 1877, p. 45.—Barbour and Loveridge, 1929, p. 338.—Goin, 1959b, p. 340.

1874. *Scytopsis cryptanthus* Cope, 1874b, p. 123 (type locality, Nauta).

1874. *Scytopsis rubra x-signatus*.—Cope, 1874b, p. 124.—Müller, 1927, p. 266.

1874. *Scytopsis ruber*.—Cope, 1874b, p. 124.

1913. *Hyla quinquefasciata* Fowler, p. 160 (type locality, Chimbo, Ecuador).—Nieden, 1923, p. 275.—Gorham, 1963, p. 23.

1941. *Hyla rubra hubneri* Melin, p. 32 (type locality, Taracua, Río Vaupés, Amazonas, Brazil).

1941. *Hyla rubra inconspicua* Melin, p. 34 (type locality, Roque, Peru).

1951. *Hyla rubra duartei* B. Lutz, 1951b, p. 705 (type locality, Brazil, Alto Itatiatia, above 1,800 m.).

1951. *Hyla rubra fuscomarignata* B. Lutz, 1951b, p. 706.

1960. *Hyla rubra nasica.*—Gans, 1960, p. 301.

Diagnosis.—A moderate-sized, short-legged *Hyla* with just a trace of web at base of fingers and with distinct black and white markings on posterior face of thighs.

The closest relative of *H. rubra* in Colombia, and the ones with which it is most likely to be confused, are *H. boulengeri* and *H. foliamorta.* From both of these it may be distinguished by its smaller size and the fact that the black markings on the face of the thigh are in the form of vermiculations rather than broad, vertical dark bands.

Description.—CNHM 81818, from Mariquita, Tolima, Colombia. Vomerine teeth in two short, rounded series, lying close together between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border slightly free and almost imperceptibly notched. Snout moderate, flat, somewhat pointed when viewed from above, broadly pointed in profile, the upper jaw extending considerably beyond lower; nostrils between lateral and superior, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal their distance from eye. Canthus rostralis slightly defined; loreal region rounded and somewhat oblique, the upper lip flaring out below it. Eye moderate, prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance equal to one-third its own diameter. Fingers with a trace of web at base, fourth finger considerably longer than second, just reaching to disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching nearly to base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a much smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little broader than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and not so finely granular; a well-developed skinfold across chest; adult male, vocal sac subgular. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 32.5 mm.; head length, 12 mm.; head width, 11 mm.; femur, 13.6 mm.; tibia, 16.9 mm.; heel-to-toe, 23.7 mm.; hand, 10.2 mm.

Color in alcohol.—A rather brownish frog with indistinct dorsolateral stripes. On the moderate brown dorsal background indistinct darker brown markings occur as follows: a narrow line along each canthus from naris to eye; an inverted triangular-shaped interocular bar; a line from the posterior corner of the eye that passes above the tympanum, thence downward toward the shoulder where it terminates; a line from the hind margin of the upper lid that passes straight back to the region of the sacral hump. The area on each side between the dark lines that terminate above the shoulder and those that pass on back to the sacral hump is somewhat lighter than the rest of the dorsum and appears to form an indistinct dorsolateral light stripe. Each groin and the anterior face of each thigh is marked with distinct black flecks and the posterior surface of each thigh with distinct, somewhat vermiculate areas of light that are outlined with dark brown and which form the thigh pattern so characteristic of this species. There are a few faint fleckings on the chin and throat, the rest of the ventral surface is a dirty gray.

Remarks.—Dunn told us many years ago that when he first started studying the lizards in the Instituto de Ciencias Naturales, in Bogotá, he would take a bottle of one species off the shelf and find that it had been described six times and then find that the next six species had not been described at all. While of course the number of times mentioned by Dr. Dunn in his story is fictitious, the implied situation is not, for we find common, widespread species of South American amphibians and reptiles described time and time again. In the case of the present species, as we now understand it, we find that a new name has been proposed for it (or a part of it) no less than 14 times. By placing all of these names in the synonymy, as we have done above, we do not mean to imply that *rubra* is not a variable species with perhaps a number of geographic races worthy of recognition. However, until a really thorough study is made of the variations, both geographic and individual, in this species, it seems to us rather futile to attempt to apply names to each of the populations. From our experience, we can state that the specimens from Leticia have a different tooth count from those of Trinidad (Goin, 1958) and that each of the populations from which we have seen fresh or live material—Amazon basin, Trinidad, Moscopán in the Andes, the rainforest in the lowlands of western Colombia, Suriname, and Bolivia—has a somewhat different mien. One of the reasons we are not ready to commit ourselves to the assignment of names to the different populations is because obviously there are many large and important geographic areas from which we have not seen well-preserved fresh material; and, just as obviously, there is much type material that needs to be studied. We have seen the types of only five of the named forms listed in the synonymy: *alleni*, *hubneri*, *inconspicua*, *cynocephala*, and *quinquefasciata*.

We therefore leave the problem of working out the various races and sibling species (if any) of *rubra* to someone who has the time and material to tackle the whole problem throughout the range of the species. We hope that this will be soon.

We do not think that Gans (1960, p. 301) was correct in using Cope's name *nasica* as a race of this species. We have studied a cotype of *nasica* (USNM 5835) from Paraguay and do not believe it is of the species *rubra*.

Specimens Examined

COLOMBIA

Amazonas: Leticia, CJG 2329, 2330 (40), UF 8510 (3), 8511 (3), 8512 (2), 8513 (11), 8514 (11), 8515 (3), 8516, USNM 146255, 146258, 152000–9, Puerto Nariño, MLS 14, 21.

Bolívar: Gambote, CJG 2443; Sincelejo-Tolú, CJG 2458–9.

Boyacá: Muzo, MLS 197.

Caldas: Pueblorrico, CNHM 54774.

Caquetá: Aserrío, MLS 28, 28a–c; Florencia, USNM 152072–4; La Providencia, Río Orteguaza, USNM 152038–46; Morelia, ANSP 23343–5, 25472–82, USNM 152075–80; Villa María, Río Orteguaza, MLS 29, 29a,c,d.

Cauca: Near Altimira, Moscopán, CJG 2269–71, 2272 (10).

Chocó: Andagoya, BM 1915.10.21.71.

Córdoba: Río Manso, CJG 2432 (113); Tierra Alta, CNHM 61753.

Cundinamarca: Aguadita, ANSP 24332–4; Beltrán, FM 16–21; east of Bogotá, ANSP 24398–400.

Huila: Neiva, USNM 152184.

Meta: Caño Losada, Serranía de La Macarena, USNM 152191–2; Río Guayabero, Serranía de La Macarena, USNM 152196–7; Villavicencio, USNM 152247, MLS 73.

Nariño: Imbili, CJG 2351–2; Río Rumiyaco, CNHM 54777.

Norte de Santander: La Selva, MLS 212; Páramo de Tama, CNHM 5647; Rio Zulia, 20 km. west of Cúcuta, USNM 152120.

Putumayo: Puerto Asís, USNM 152282.

Santander: 4.7 km. southeast of Bucaramanga, JRT 394–7.

Tolima: Espinal, MLS 280; Mariquita, CNHM 81818–20, USNM 152123–7, 152288–311; Mesa de Cucuana, region of Guamo, USNM 152312.

Vallé: Río Rapaso, USNM 151452.

"Colombia": BM 1915.10.21.71.

BRAZIL: Pará, ANSP 2159 and MCZ 1519 (types of *Scytopis alleni*); Jaracua, Río Vaupés, Amazonas, NM 476 (41–7893) (type of *Hyla rubra hubneri*).

ECUADOR: Chimbo, ANSP 18115 (type of *Hyla quinquefasciata*).
"GUIANA": MHNP 765 (type of *Hyla cynocephala*).
PANAMA: Darien, El Real, USNM 140569–70, 140573; Panama Canal Zone, USNM 37863; Trinidad River, USNM 64003.
PERU: Roque, NM 480 (type of *Hyla rubra inconspicua*).
SURINAME: Paramaribo, CJG 2391–4.
TRINIDAD: UF 3648 (4).

Hyla boulengeri (Cope)

PLATE 32D–F

1887. *Scytopis boulengeri* Cope, 1887b, p. 12 (type locality, Nicaragua).
1901. *Hyla boulengeri*.—Günther, 1901, p. 267.—Noble, 1918, p. 339.—Nieden, 1923, p. 251.—Barbour and Loveridge, 1929, p. 279.—Dunn, 1931, p. 413.—Gaige, Hartweg, and Stuart, 1937, p. 4.—Taylor, 1952, p. 856.—Fouquette, 1958, p. 125; 1960a, p. 58.—Gorham, 1963, p. 21.—Rivero, 1963b, p. 199; 1964b, p. 311.
1928. *Hyla lancasteri* Barbour, p. 31 (type locality, Perlata, Costa Rica).—Barbour and Loveridge, 1929, p. 279.

Diagnosis.—A rather large *Hyla* of the *rubra* group with broad, vertical dark bars on the posterior faces of thighs and generally with a rather light chin and throat.

From its close relatives in Colombia *H. boulengeri* may be distinguished from *H. rubra* by having the dark markings on the posterior surfaces of the thighs in the form of broad, vertical dark bands rather than in the form of vermiculations; and from *H. foliamorta* by having the undersurface of the proboscis, the chin, and the throat pale rather than dark. For a detailed comparison of *boulengeri* with *foliamorta* see "Remarks" under the latter species.

Description.—CNHM 81854, from Andagoya, Chocó, Colombia. Vomerine teeth in two transverse series, lying close together between the moderate-sized, very elongate choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border fused and with just a trace of a notch. Snout elongate, rather lanciform when viewed from above, rounded in profile, the upper jaw extending somewhat beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-fourth that from eye, separated from each other by an interval equal to about two-fifths their distance from eye. Canthus rostralis slightly defined; loreal region concave and rather oblique, the upper lip flaring out strongly below it. Eye moderate, not particularly prominent, its diameter equal to about three-fifths its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is in turn equal to the distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers with just a hint of web at base, fourth finger just slightly longer than second, not reaching to disk of third which covers about one-third the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the distal end of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow barely overlap; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts very finely granular on top of head and snout and in the region behind the tympanum and above the shoulders but otherwise the dorsal surfaces are rather smooth; a rather narrow inconspicuous glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; well-developed traces of a skinfold across chest; adult male, vocal sac not expanded. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 36.5 mm.; head length, 14.5 mm.; head width, 12.5 mm.; femur, 17.2 mm.; tibia, 21.2 mm.; heel-to-toe, 27.2 mm.; hand, 10.6 mm.

Color in alcohol.—A medium brown frog with mottlings of dark brown. The most conspicuous of the darker brown dorsal markings are as follows: an interocular triangle with its apex directed posteriorly; a band on each side that originates behind the eye, passes above the tympanum, and then fades out just posterior to the suprascapular region; a small L-shaped blotch in the middle of the back; a transverse bar at the level of the sacral hump; and two little longitudinal bars between the sacral hump and the vent. There are several broad dark bands across the thighs and shanks, and these bands continue on to the posterior surfaces of the thighs. Most of the rest of the pattern is simply made up of tiny flecks of pigment scattered over the medium-brown ground color. Except for a faint hint of dusky pigment around the edge of the lower jaw, the ventral surfaces are immaculate.

Remarks.—The amount and degree of variation in the specimens before us are hardly more than would be expected in any lot of specimens collected and preserved by different persons at different times. The type has faded to the point where no pattern is discernible but it is perfectly recognizable structurally. The specimens from Colombia range from 32.9 to 48.7 millimeters in head-and-body length.

The specimens from the Amazon drainage in Meta do not seem to be different in any significant manner from the other Colombian specimens.

A detailed comparison between *boulengeri* and *foliamorta* is given under the discussion of the latter species.

Specimens Examined

COLOMBIA
  Chocó: Andagoya, CNHM 81854–5.
  Córdoba: Río Manso, CJG 2431.
  Cundinamarca: Caparappí, MLS 118.
  Meta: Mouth of Caño Losada, USNM 152186–8; Villavicencio, MLS 70, 70a.
  Norte de Santander: La Selva, MLS 211.
  Putumayo: Puerto Asís, USNM 152278.
  Santander: Simitarra, Río Guayabito, USNM 152285.
  Tolima: Maraquita, CNHM 81824–5.
  Vaupés: Río Piraboton, CNHM 82008.
NICARAGUA: USNM 13974 (type).

Hyla foliamorta Fouquette

Plate 32a–c

1958. *Hyla foliamorta* Fouquette, p. 125 (type locality, seven mi. northwest of Miraflores Locks, Panama Canal Zone).

Diagnosis.—A rather large frog of the *rubra* group with broad, vertical dark bars on the posterior face of the thigh and with generally a dark chin and throat and with the ventral surface of the rostrum rather dark.

H. foliomarta can be separated from *H. rubra* by having the dark markings on the posterior faces of the thighs in the form of broad, vertical bars rather than vermiculations. From *H. boulengeri*, to which it is very closely related, it may be differentiated by the dark throat and chin and the dark underside of the rostrum (see "Remarks" for a detailed comparison).

Description.—USNM 127865, from El Real, Antioquia, Colombia. Vomerine teeth in two short, slightly V-shaped series, lying close together between the moderate-sized, oblong choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border very slightly free and unnotched. Snout long, pointed when viewed from above, pointed in profile, the upper jaw extending considerably beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about one-half their distance from eye. Canthus rostralis slightly defined; loreal region not concave but very oblique, the upper lip flaring out rather strongly below it. Eye neither large nor prominent, its diameter a little less than its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid and than the distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers with but the merest trace of web at base, fourth finger but slightly longer than second, not reaching to disk of third which covers about three-fourths the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the distal end of the antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts generally smooth but with a few granulations on top of snout, in the region behind the eyes, above the tympanum, and at insertion of the arms. A well-developed narrow glandular ridge passes above the tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; a skinfold across chest; adult male, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 40.3 mm.; head length, 15.3 mm.; head width, 14.8 mm.; femur, 21.7 mm.; tibia, 26.6 mm.; heel-to-toe, 34.7 mm.; hand, 12.3 mm.

Color in alcohol.—A dark brown frog with a limited pattern of black. The main elements of the pattern are as follows: a black-bordered interocular triangle with its apex pointed posteriorly; black supratympanic glandular ridges; a pair of small but conspicuous suprascapular spots; and black bands across the anterior and posterior faces of the thighs. On top of the thighs and shanks and, to a lesser extent, on the wrists there are faint crossbands of grayish brown. The entire undersurface of chin and throat is tinged with dusky.

Remarks.—The following comparison of *Hyla boulengeri* and *H. foliamorta* was made by the junior author and Dr. M. J. Fouquette while they had all of the Colombian material of *boulengeri* and *foliamorta* and the type of *foliamorta* before them.

"Comparison of *foliamorta* with *boulengeri:* First, in general although not invariably, *foliamorta* seems to have more pointed tip to the snout. This can be more readily seen from the ventral view.

It is a more projecting snout. Secondly, males of *foliamorta* seem to have a darker throat than do males of *boulengeri*. In *foliamorta*, the dusky spots are so small and so thickly scattered that you get the impression of a more or less gray or dark throat, brownish perhaps, whereas in *boulengeri* you get the impression of a white throat with dark specks scattered about on it. From a ventral view the lower surface of the rostrum tends to be dark in *foliamorta* whereas generally it is light with perhaps just some dark flecks on it in *boulengeri*. Also, *foliamorta* tends to have the region of groin where the anterior face of the thigh meets the side clear, whereas in *boulengeri* there tends to be in this region a dark spot similar to those along the face of the thigh. In other words, the corner of the groin in *foliamorta* is more often clear; the corner of the groin in *boulengeri* is more often dark. In general, the leg of *boulengeri* seems to be shorter, the heel reaching between the eye and nostril; whereas in *foliamorta* it tends to be longer, the heel reaching to the nostril or to the tip of the snout or perhaps even somewhat beyond that. The dark interocular triangle in *foliamorta* seems to be bordered by a narrow but quite distinct glandular ridge on all three sides. This ridge is not actually in contact with the dark triangle but separated from it by a millimeter or two. Sometimes similar ridges are present in *boulengeri* but when they are present they are never so conspicuous. Dorsally, *boulengeri* seems to have a rougher, more tuberculate skin, whereas *foliamorta* seems to have the skin of the dorsum smoother and less tuberculate. Furthermore, on the postocular glandular fold of *foliamorta*, the dark supratympanic stripe that follows along it seems to stand out rather strikingly against a generally paler background, as do the three suprascapular spots posterior to it. These same stripes and spots can usually be made out in *boulengeri* but because of the dark roughened skin they are not nearly so prominent. Sometimes in *boulengeri* these stripes and spots may not even be discernible. An additional character can sometimes be noted along the lower jaw; in *boulengeri* this is usually margined with tubercles ranging from inconspicuous to conspicuous, whereas in *foliamorta* the lower margin of the lower jaw seems to be rather smooth all the way from front to back."

At that time it was decided (by Goin and Fouquette) that the two specimens listed here from El Real, Antioquia, Colombia, were the only known Colombian representatives of *foliamorta*. If these two nominal forms are really distinct, it seems unlikely that their present distribution can be worked out in any detail except by studies made on the species in life.

Specimens Examined

COLOMBIA

Antioquia: El Real, USNM 127865–6.

PANAMA CANAL ZONE: Seven mi. northwest of Miraflores Locks, TNHC 23109 (type of *Hyla foliamorta*).

13. PALPEBROGRANULATA group

Members of this group are moderate-sized *Hyla* with the vomerine teeth in two, short, transverse series on a level with the posterior margin of the choanae; with well-developed patagia but without ulnar or tarsal ridges or dermal heel appendages; with distinct dorsal patterns; and with distinct crossbands on the thighs. A distinct, white, subocular blotch runs from the eye to the lip on each side. The group is presently represented by only one species.

Hyla palpebrogranulata **Andersson**

PLATE 33A–C

1906. *Hyla palpebrogranulata* Andersson, p. 14 (type locality, Tatarenda, Chaco, Bolivia).—Gorham, 1963, p. 22.

1941. *Hyla mimetica* Melin, p. 24 (type locality, Roque, Peru).—Gorham, 1963, p. 22.

Diagnosis.—A moderate-sized *Hyla* with the vomerine teeth in two short, transverse series (on a level with the posterior margin of the choanae), reduced webbing between the toes, a well-developed patagium, distinct crossbands on thighs and shanks, and dark flecks on chin, throat, and venter. There is a distinct, white, subocular blotch on each side that extends from eye to the margin of the lip.

The form and position of the vomerine teeth somewhat resemble those in *Cryptobatrachus* and *Hyla phantasmagoria*, but *palpebrogranulata* does not seem to be closely related to either and can be immediately distinguished by its patagium. The patterned thighs and the granulations on the back separate it at once from the members of the *leucophyllata* group.

Description.—USNM 152757, from Medina, Cundinamarca, Colombia. Vomerine teeth in two short, transverse series, lying close together on a level with the posterior borders of the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border fused and unnotched. Snout moderate, U-shaped when viewed from above, slightly rounded in profile, the upper jaw extending a little beyond lower; nostrils lateral, hardly at all superior, somewhat projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis moderately defined; loreal region slightly concave and a little oblique, the upper lip flaring out slightly below it. Eye neither large nor prominent, its diameter not quite equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is in turn about equal the distance between nostrils. Tympanum very distinct, about two-thirds the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web reaching to middle of antepenultimate phalanx on lateral side and middle of antepenultimate phalanx on medial side, fourth finger a disk shorter than third but a disk longer than second, disk of third finger very nearly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than three-fourths webbed, the web on fourth toe reaching the middle of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner and a smaller but very distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee nearly reaches axilla; when hind legs are bent at right angles to body, heels overlap greatly. A small patagium extends from the back of the upper arm to the side of body. Skin of upper parts with numerous small, rounded granular warts. These warts are most thickly concentrated on top of head and dorsum, but more widely scattered ones occur on top of snout and shanks; a well-developed glandular ridge passes above the tympanum; skin of throat and chest fairly smooth, that of belly and lower surface of thigh uniformly granular; no distinct traces of a skinfold across chest; adult male, vocal sac slightly discernible at angle of jaws. Skin of head not coossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 36.7 mm.; head length, 14.3 mm.; head width, 12.8 mm.; femur, 17.4 mm.; tibia, 20.5 mm.; heel-to-toe, 25.3 mm.; hand, 11.2 mm.

Color in alcohol.—A brown frog with dorsal markings of darker brown. A dark interocular bar connects posteriorly with a dorsal blotch that extends backwards to the vicinity of the sacral hump. There are a few small blotches on the back posterior to the sacral hump and a few small rounded blotches high up on the sides between the axilla and groin. A dark postocular bar extends from eye through the tympanum and fades out above the shoulders. Broad, well-developed, dark crossbands occur on the dorsal surfaces of shanks and less-well-defined but nonetheless distinct ones occur on dorsal surfaces of thighs. The posterior and anterior faces of thighs are without pattern. Top of snout and loreal regions are somewhat darker than the rest of the dorsal surfaces exclusive of the blotches. A light subocular area is reminiscent of that of *Hyla versicolor*. The ventral surfaces are a dull brownish gray.

Variation.—All the specimens we have seen have dark blotches on the back, but no two have exactly the same pattern. In every individual there is a dark interocular bar, and the postocular region around the tympanum is dark; otherwise, the dorsal pattern is quite variable. The specimens range from such extremes as USNM 152090, which has scattered, small, brown blotches on the back, to USNM 152091, in which there is a solid, median, dorsal dark blotch from between the eyes to above the sacral hump, which leaves the areas lateral to the dorsal dark blotch paler and thus reminiscent of dorsolateral stripes. The amount of the ventral markings is quite variable. In some individuals there are distinct dark spots along the lower margins of the jaws, the throat region, and anterior chest region. In others the ventral fleckings are reduced, particularly posteriorly, but in nearly every individual some degree of ventral flecking is discernible. The dorsal surface of each thigh and shank is crossed with about three rather distinct and rather broad dark bands, these being much more distinct on the shank than on the thigh, but nonetheless the thigh is heavily colored rather than clear. In every specimen there is a distinct white blotch on the upper lip below the eye.

The dorsal body surface in most individuals is thickly covered with tiny, rounded, wart-like structures, making the dorsal surface very granular, reminiscent of the condition seen in some specimens of *Osteocephalus.*

Our three largest specimens are 36.5, 38.5, and 40.3 millimeters in head-body length.

Remarks.—The specimen described above has been directly compared with the type of *palpebrogranulata* in the Zoological Institute of the University of Stockholm. Although the described specimen is a little larger and a little darker than the type, these differences seem to be due to age and preservation, and it seems to us that there can be no doubt that the two specimens are conspecific. They have the same general build, the same granulated skin on the dorsum, the same vomerine tooth pattern, and essentially the same amount of webbing between the fingers and toes. The patterns of the two specimens are not identical but there is no more difference between them than there is between any of those in a series of six specimens (USNM 152092–7) taken at the same time and same place, in Medina, Cundinamarca.

We have also examined the type of *Hyla mimetica* Melin, from Peru, which is now preserved in the Zoological Museum of Uppsala, and we believe it represents the same species. Both that type and USNM 152091 seem to have the dorsum smooth rather than coarsely granulated as in *palpebrogranulata,* but we can see no other structural difference between *palpebrogranulata* and *mimetica.* Both types have the distinct white blotches on the margin of each upper lip, between the edge of the lip and the eye.

Specimens Examined

COLOMBIA
  Boyacá: Sutatenza, USNM 152054–5.
  Cundinamarca: Medina, USNM 152089–97, 152757.
  Meta: Villavicencio, MCZ 16269–71.
BOLIVIA: Chaco, Tatarenda, NR A.133 (type of *Hyla palpebrogranulata*).
PERU: Roque, ZIMUG 41/7893, Ex. 469 (type of *H. mimetica*).

14. LABIALIS group

Medium-sized *Hyla* with the vomerine teeth in two small, rounded patches and with well-developed patagia which are bright blue in life. There are at present three vicarious forms in this group—*H. labialis krausi*, *H. l. labialis*, and *H. l. platydactyla*. We must await the receipt of fresh material before deciding on the status of the frogs that Ruthven (1922, p. 55) reported from Santa Marta. The three forms may be distinguished as follows:

a^1. Posterior face of the thigh uniformly pigmented or lightly speckled but not distinctly mottled.
  b^1. The length of the crus not more than half the head-body length. **H. labialis labialis**
  b^2. The length of crus more than half the head-body length **H. labialis krausi**
a^2. Posterior face of the thighs distinctly mottled . . . **H. labialis platydactyla**

Hyla labialis labialis Peters

Plate 33d–f

1863. *Hyla labialis* Peters, 1863b, p. 463 (type locality, mountainous surroundings of Bogotá); 1873b, p. 618.—Boulenger, 1882a, p. 397.—Nieden, 1923, p. 261.—Hellmich, 1940a, p. 8.—Dunn, 1944a, p. 72; 1957, p. 10.—Stebbins and Henderickson, 1959, p. 522.—De Luque and Hunter, 1959, p. 460.—Rivero, 1961, p. 133.—Hunter and Murcia de V., 1962, p. 573.
1899. *Hyla creolica* Werner, p. 484 (type locality, sabana near Bogotá).—Nieden, 1923, p. 263.—Dunn, 1944a, p. 72; 1957, p. 10.—Stebbins and Hendrickson, 1959, p. 522.
1899. *Hyla servalina* Werner, p. 484 (type locality, Boquerón near Bogotá).—Nieden, 1923, p. 263.—Dunn, 1944, p. 72; 1957, p. 10.—Stebbins and Hendrickson, 1959, p. 522.
1899. *Hyla vilsoniana* Cope, p. 3 (type locality, believed neighborhood of Bogotá).—Nieden, 1923, p. 263.—Dunn, 1944a, p. 72; 1957, p. 10.—Stebbins and Hendrickson, 1959, p. 522.—Rivero, 1961, p. 132; 1963a, p. 95.
1914. *Hyla wilsoniana*.—Peracca, p. 108.—Lutz, 1927, p. 40.—Hellmich, 1940a, p. 8.—Rivero, 1961, p. 131.
1916. *Hyla gularis* Werner, p. 302 (type locality, Bogotá).—Dunn, 1944a, p. 77; 1957, p. 10.—Stebbins and Hendcrickson, 1959, p. 522.—Rivero, 1961, p. 132.

Diagnosis.—A frog of the *labialis* group with a well-developed patagium which is bright blue in life.

This subspecies differs from *Hyla labialis krausi* in having shorter legs and the length of the crus less than half the head-body length. It differs from *H. l. platydactyla* in having the groins and the posterior surfaces of the thighs uniform or lightly speckled but not distinctly mottled.

Description.—USNM 95155, from Bogotá, Cundinamarca, Colombia. Vomerine teeth in two small, rounded patches, lying close together between the small, rounded choanae; tongue one-half as wide as mouth opening, thick, broadly rounded, its posterior border slightly free and very shallowly notched. Snout short, somewhat triangular when viewed from above, slightly rounded in profile, the upper jaw extending but little beyond lower; nostrils as lateral as superior, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis moderately defined; loreal region nearly flat and slightly oblique, the upper lip flaring out a little below it. Eye small, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid and slightly greater than distance between nostrils. Tympanum distinct, about one-half the diameter of eye, separated from eye by a distance equal to its own diameter. Fingers webbed at base, the web reaching base of antepenultimate phalanx of third finger, fourth finger considerably longer than second, just reaching to disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly less than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-half the tympanic area; a distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; no outer but a weak inner tarsal ridge; no dermal appendage on heel. Body short and stout, in postaxillary region about equal greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap appreciably; when hind legs are bent at right angles to body, heels overlap considerably. A distinct patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a rather narrow, glandular ridge encircling upper part of tympanum; skin of throat and chest somewhat wrinkled in appearance, that of belly and lower surface of thigh uniformly and coarsely granular; a well-developed skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 39.6 mm.; head length, 15 mm.; head width, 15 mm.; femur, 18.2 mm.; tibia, 20.4 mm.; heel-to-toe, 30.4 mm.; hand, 12.8 mm.

Color in alcohol.—A rather dark gray frog without much pattern. Along the sides, where the dark gray of the dorsum merges gradually with the cadaverish gray of the venter, inconspicuous small black specks may be seen; a few similar specks are present on the lateral margins of the shanks, feet, and hands.

Remarks.—Dr. Dunn reported on the pattern variation as seen in *labialis*, and we quote his discussion here (Dunn, 1957, p. 11):

> The most frequent coloration is a rather uniform bright light green above, paler below and with blue in the concealed surfaces and, in large individuals, on the belly also. A black line runs from the nostrils back over the tympanum to widen and fade out on the body. This was the color of the types of *labialis* and of *vilsoniana*. The black line may be lacking in some bright green individuals (types of *gularis*). There is some ability for color change in individuals in life (in tone, not in pattern), and most of the uniform specimens darken in preservation, but there are also very dark olive green individuals (almost black) and the black line does not show up in these either (types of *creolica*).
>
> Green individuals may be irregularly spotted with black on the whole dorsal surface (type of *servalina*). Very frequently the green is not uniform, diffuse black pigment producing darker sides and a darker dorsum, the two separated by a light dorsolateral band, and the dorsum divided by a lighter and vaguer mid-dorsal light line wider and more prominent posteriorly. These also may have the black "*servalina*" spotting.
>
> An occasional frog may not be any shade of green at all but a golden brown, either uniform or with the lighter dorsolateral band. A combination of the striping, the "*servalina*" spotting, with green and golden brown each forming irregular parts of the background produces a very gaudy frog indeed.
>
> I have kept these different color forms alive for days and the individuals maintained their colors constantly, except for a little darkening or lightening of the general tone.

After having collected and studied the form in life in Bogotá and its environs, we can add nothing pertinent to the above discussion.

We have seen the two specimens (MZUM 48283-4) that formed the basis of Ruthven's (1922, p. 55) report of the species from Santa Marta. While the two individuals do seem in general characters to be perhaps related to the *labialis* group, they cannot, in our opinion, be referred to either *H. l. labialis* or *H. l. platydactyla*. They do have a patagium, but it is impossible, in their faded condition, to tell if it was pigmented in life. One of the specimens seems to be immature; the other is an adult female that measures 24.5 millimeters in head-body length, appreciably smaller than adult females of *H. l. labialis* or *H. l. platydactyla*. Likewise, the vomerine teeth series seem to be shorter than in typical *H. l. labialis*.

Two specimens in the British Museum (BM 1902.5.15.23-24) are here referred to this form. One of the two is now pale gray with black, vermiculate spots on the back, arranged more or less in rows such as one finds in the "*servalina*" pattern.

Hunter and Murcia de V. (1962, pp. 573–583) recently published an excellent, detailed report of oögenesis in this species.

Specimens Examined

COLOMBIA

Boyacá: Laguna de Tota, JRT 34 unnumbered, USNM 152034, SUNHM 20289; Páramo Vijogual [20 km. north of Pajarito], CJM 1252 (4); Tunja, USNM 152057–9.

Cundinamarca: Aguadita, ANSP 24335–9; Arracachal, CNHM 81897, USNM 152176–8; Bogotá, ANSP 25772, BM 68.3.4.5–6, 1909.7.23.6, 1919.3.6.35–6, 1900.2.7.5 [1947.2.4.14] (type of *creolica*), CJG 2290 (24), CNHM 81892, MCZ 9046–51, MZUM 57487, 57494, 76071, 78302 (14), 78310 (52), 89423 (31), 92161 (14), USNM 94958–66, 95152–76, 95872–921, 152083–7, 152159–70; Choachí, MZUM 89455; Cota, CNHM 81895, FM 287 (21); Cruz Verde Páramo, CNHM 81896; Gutiérrez, MLS 260; Madrid, USNM 152171–3; Páramo de Palacio, USNM 152174–5; Páramo de Verjon, near Bogotá, USNM 152088; Tabio, CNHM 81893–4; Villeta, BM 1902.5.15.23–4.

Meta: Villavicencio, BM 1915.3.11.6–14.

Hyla labialis krausi Hellmich

Figure 24

1940. *Hyla vilsoniana krausi* Hellmich, 1940a, p. 8 (type locality, Laguna de la Guitarra, Páramo de Sumapaz, Cundinamarca, Colombia)—Rivero, 1963a, p. 95.

Diagnosis.—A large frog of the *labialis* group with a well-developed patagium which is bright blue in life.

Hyla labialis krausi differs from *H. platydactyla* in that the groins and posterior surfaces of the thighs range from uniform to lightly speckled but are never distinctly and brightly mottled; it differs from *H. labialis* in having longer legs and the length of the crus more than half the head-body length.

Description.—ZSM 102/1937 (holotype), from Laguna de la Guitarra, Páramo de Sumapaz, Cundinamarca, Colombia. Vomerine teeth in two short, transverse series, lying rather far apart between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border free and very shallowly notched. Snout moderate, somewhat U-shaped when viewed from above, broadly rounded in profile, the upper jaw extending but little beyond lower; nostrils as dorsal as lateral, slightly projecting, their distance from end of snout about equal that from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis well defined; loreal region slightly concave and somewhat oblique, the upper lip flaring out a little below it. Eye moderate, very prominent, its diameter greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum distinct, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to two-thirds its own diameter. Fingers webbed at base, fourth finger considerably longer than second, just reaching to disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region about equal greatest width of head; when hind leg is adpressed, heel reaches to nostril; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a rather narrow glandular ridge passes above the tympanum; skin

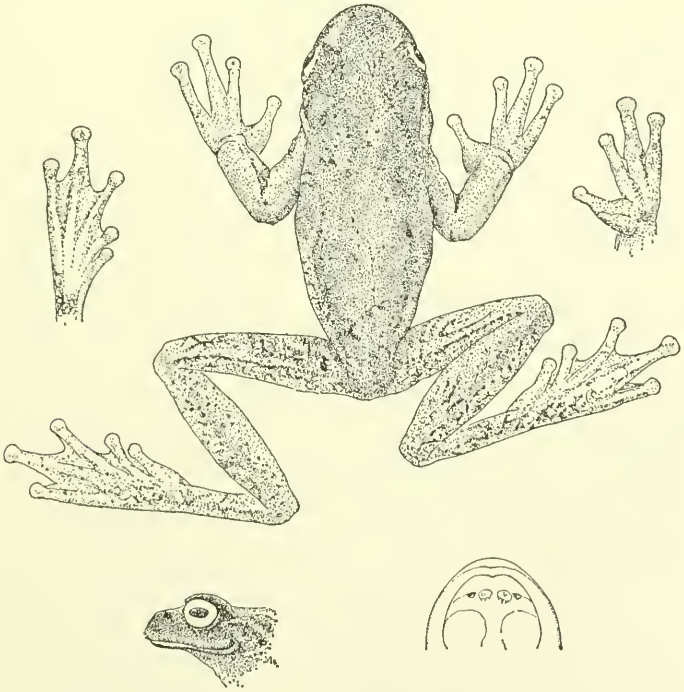

Figure 24.—*Hyla labialis krausi*, holotype, ZSM 102 (same size).

of throat and chest finely granular, that of belly coarsely granular, and lower surfaces of thighs uniformly and very finely granular; traces of a skinfold across chest. Adult male, vocal sac apparent as wrinkles on the throat. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 50.5 mm.; head length, 15.4 mm.; head width, 17.6 mm.; femur, 24.5 mm.; tibia, 26.5 mm.; heel-to-toe 39.2 mm.; hand, 23 mm.

Color in alcohol.—Dark bluish gray above, cadaverish, brownish gray below. All of the dorsal surfaces are marked with tiny, black, pencil-like flecks and spots. The anterior and posterior surfaces of the thighs are lightly mottled but not nearly so heavily or conspicuously so as in *H. labialis platydactyla.* The ventral surfaces seem to be without pattern. The nuptial pads on the thumbs are very dark gray.

Remarks.—The type series of this form, which is apparently valid, is now represented by a single specimen, the type, as all the paratypes were destroyed during World War II. The three specimens from Gutiérrez are the only ones we know of other than the type.

We are greatly indebted to Dr. Hellmich for the privilege of studying and illustrating the type specimen.

Specimens Examined

COLOMBIA

Cundinamarca: Gutiérrez, MCZ 16032–3, 16276; Laguna de la Guitarra, Páramo de Sumapaz, ZSM 102/1937 (type).

Hyla labialis platydactyla **Boulenger**

Plate 34a–c

1905. *Hyla platydactyla* Boulenger, p. 183 (type locality, Mérida, Venezuela).—Nieden, 1923, p. 262.—Lutz, 1927, p. 39.—Rivero, 1961, p. 115; 1963a, p. 93.—Gorham, 1963, p. 22.

1961. *Hyla vilsoniana meridensis* Rivero, p. 131 (type locality, Mérida, Venezuela), 1963a, p. 93; 1964a, p. 302.

Diagnosis.—A frog of the *labialis* group with a well-developed patagium which is bright blue in life.

Hyla labialis platydactyla differs from *H. l. labialis* and *H. l. krausi* in that the posterior faces of the thighs are distinctly mottled.

Description.—MZUM 92162, from Chita, Boyacá, Colombia. Vomerine teeth in two short, nearly transverse series lying fairly close together between the small, rounded choanae; tongue three-fourths as wide as mouth opening, very broadly cordiform, its posterior border free and unnotched. Snout short, rounded when viewed from above, nearly truncate and very slightly sloping in profile, the upper jaw extending but slightly beyond lower; nostrils nearly lateral, slightly projecting, their distance from end of snout about one-half that from eye. Canthus rostralis very well defined; loreal region very slightly concave and nearly vertical, the upper lip flaring out hardly at all below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance one-third again the width of upper eyelid, which is slightly less than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to two-thirds its own diameter. Fingers webbed at base, fourth finger longer than second, just reaching to disk of third which covers about three-fourths the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching nearly to tip of antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about three-fourths the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region just a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to nostril; when limbs are laid along the side, knee and elbow meet snugly; when hind legs are bent at right angles to body, heels overlap appreciably. A weak patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a rather narrow glandular ridge passing above tympanum; skin of throat finely granular, that of chest, belly, and lower surface of thigh uniformly and more coarsely granular; a rather distinct skinfold across chest. Adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 39.5 mm.; head length, 12.7 mm.; head width, 13 mm.; femur, 19.2 mm.; tibia, 21.5 mm.; heel-to-toe, 29.9 mm.; hand, 10.8 mm.

Color in alcohol.—Top of head and dorsum uniform bluish-gray, ventral surfaces a dark cadaverish gray. The axillae, groins, anterior and posterior faces of thighs, and undersurfaces of shanks and feet very dark gray, nearly black, with a distinct pattern of vermiculations. The tops of the arms and hands and the shanks and feet are bluish-gray, as the dorsum, but on top of the thigh the blue-gray of the dorsum is restricted to a rather narrow stripe of ground color pigment that separates the pattern of vermiculations on the front of the thigh from that on the back.

Remarks.—There seems to be no doubt that the population of *Hyla labialis* in the northern portion of the Sierra Oriental of the Andes in Colombia and Venezuela is sharply different from the population of typical *labialis* around Bogotá. The only question is whether the specimens we examined from Boyacá should be listed as typical *platydactyla* or whether they should be listed as intergrades. We have seen the type of *platydactyla* and that of *meridensis*, and on the basis of an examination of these types we are calling the Boyacá specimens typical *platydactyla;* however, a series of fresh material from the Venezuelan Andes is required before the limits of variation in *platydactyla* can be ascertained.

The type of *meridensis* is very similar to the Colombian specimens from Boyacá, while the type of *platydactyla*, although somewhat old and faded, appears to have more of a "*servalina*" pattern (see under *H.l. labialis*).

Specimens Examined

COLOMBIA
Boyacá: Chita, MZUM 92162 (19).
VENEZUELA: Mérida, BM 1904.6.30.17 [1947.2.13.14] (type of *platydactyla*); MCZ 2527 (type of *meridensis*); near Mérida, Chama, USNM 71114.

15. VARIABILIS group

Small to medium-sized tree frogs with small, rounded vomerine tooth patches and with well-developed patagia which are pink or red in life. As in the previous group, which occupies the Sierra Oriental, this group of the Sierra Occidental likewise consists of three vicarious forms. These may be distinguished by the following key:

a^1. Either belly or dorsum, or both, with a rather distinct pattern.
  b^1. Dorsal pattern of blotches or interrupted stripes; ventral surfaces generally heavily mottled.. **H. variabilis**
  b^2. Dorsal pattern generally of rather distinct dorsolateral stripes; belly immaculate or lightly mottled.............................. **H. bogerti**
a^2. No distinct dorsal pattern and ventral surface nearly or completely immaculate.. **H. columbiana**

Hyla variabilis Boulenger

PLATE 34D–F

1896. *Hyla variabilis* Boulenger, p. 120 (type locality, Cali, Valle, Colombia).—Nieden, 1923, p. 262.—Barbour and Loveridge, 1929, p. 280.—Dunn, 1944a, p. 77.—Peters, 1952, p. 17.—Marx, 1958, p. 434.—Cochran, 1961, p. 60.

Diagnosis.—A small frog with well-developed patagium, reduced webbing between the fingers, and chin, throat, and belly generally rather heavily mottled in dark gray or black.

Hyla variabilis is most closely allied to *columbiana* and *bogerti*. From *columbiana* it differs in having a more distinct dorsal pattern and much more extensive mottling on the undersurfaces. From *bogerti* it differs in having a longer leg so that the extended heel reaches the anterior rather than the posterior margin of the eye; in having the belly much more extensively mottled; and in having dorsal stripes (such as there may be) on the back that tend to be interrupted.

Description.—USNM 71115 (cotype), from Cali, Cauca Valley, Valle, Colombia, at 3,200 feet. Vomerine teeth in two short, heavy, rounded patches lying close together between the choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border slightly free and very faintly notched. Snout moderate, somewhat triangular in shape when viewed from above, somewhat truncate in profile, the upper jaw not extending beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis rounded, slightly defined; loreal region slightly flattened, the upper lip not flaring strongly. Eye moderate, its diameter equal to its distance from nostril; interorbital space about the width of upper eyelid, which is relatively wide, slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance slightly greater than its own diameter. Fingers practically free of web, fourth finger considerably longer than second, not quite reaching to disk of third which covers the tympanic area; no rudiment of a pollex. Toes about three-fourths webbed, third toe slightly longer than fifth, disk of fourth just covering the tympanic area; an oval inner and a smaller, indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region about equal to greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap moderately. A moderately developed fold of skin (patagium) extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; skin of chest, belly, and lower femur uniformly and very finely granular; a definite skinfold across the chest; vocal sac apparently internal.

Dimensions.—Head and body, 25.8 mm.; head length, 8 mm.; head width, 8.5 mm.; femur, 12.8 mm.; tibia, 13.2 mm.; heel-to-toe, 16.3 mm.; hand, 7.6 mm.

Color in alcohol.—This specimen is now a faded uniform pale brown, above and below.

Since much of the preserved material is old and somewhat faded, we present the following description of fresh, unfaded material based on three specimens, a male and two females, collected by Dr. Wilmot A. Thornton, at Candeleria, near Cali, Valle, in June 1962.

The adult females are rather dark brown above and heavily mottled below. On one of the females are quite distinct postocular dorsolateral light stripes that continue from the eye posteriorly to behind the shoulders, but posterior to this the light of the dorsolateral stripe merges ventrally with the ventral ground color and thus the dorsolateral stripe becomes obsolete. In the same specimen the top of the head from the nostrils to between the eyes is nearly as pale as the dorsolateral light stripes. There are faint little pencil-like dark flecks in the dark dorsal ground color, but there is no discernible pattern. Likewise, the dorsal surfaces of the limbs are without distinct pattern, although their ground color is lighter than the ground color of the dorsum. The other large female lacks the distinct dorsolateral light stripes, although a hint of a paler postocular light stripe can be seen. In this specimen the dorsal surfaces of both the front and hind limbs have scattered dark flecks, as if the individual had been sprinkled with black pepper.

Ventrally the pattern of these two females is quite striking. The entire undersurface of the chin, throat, chest, and belly is heavily and coarsely vermiculated with a black and white pattern. In both specimens the undersurfaces of the thighs are darkened but not particularly vermiculated; and, in both, on the anterior face of the thigh is a pale, unpigmented band between the dorsal pigmented surface and the ventral pigmented surface, thus leaving a clear longitudinal stripe on the anteroventral surface of the thigh.

A male collected with the above two females has the dorsal pattern very similar to theirs, but with the postocular light stripes even paler than in either of them. In this male the entire undersurfaces, including those of the thighs, are immaculate.

Color in life.—In life the portion of the ventral surface which is pale in the preserved females was bright orange and the dorsal surface was dark, muddy brown, whereas the male was light orange-brown dorsally and immaculate below with just a tinge of orange-yellow on the ventral surfaces.

Remarks.—In addition to sexual differences in pattern, there is a noticeable difference in size, the females being much larger. This is shown in the following measurements, in millimeters, of the three fresh specimens described above.

Specimen	*Head-body*	*Thigh*	*Shank*
USN M151984 (♂)	21. 1	9.7	10. 9
UV 236 (♀)	29. 6	14. 5	15. 8
USNM 151983 (♀)	29. 8	13. 7	14. 8

Hyla variabilis can be found breeding throughout the Cali savanna. Where water collects in low places in the savanna, making shallow ponds, and in the heavy vegetation in the drainage ditches along the roads, these frogs are commonly heard calling, although at times they are difficult to collect.

Specimens Examined

COLOMBIA

VALLE: Cali, BM 95.11.16.65–81 [1947.2.13.15–31], CNHM 3565, MCZ 2606, MZUM 46464, 51269, 58908 (10), USNM 71115 (all cotypes of *Hyla variablis*); near Cali, CJG 2280 (8); Cerro de La Herrara, near Cali, USNM 137770–2; Candeleria, near Cali, UV 236, USNM 151983–4.

Hyla bogerti, new species

FIGURE 25

Holotype.—USNM 118731, collected at Medellín, Antioquia, Colombia, by Hno. Nicéforo María.

Paratypes.—ANSP 25005, CNHM 17098–101, MZUM 56508 (38), 60251 (2), 92167, USNM 75989, 118729–30, from Medellín, Antioquia; MCZ 7664, 7665, from near Medellín, Antioquia; ANSP 21029, CNHM 30567–9, 63884, 63897, MCZ 24911–5, USNM 152021–9, MZUM 71214, 71215 (2), 78301 (17), from San Pedro, Antioquia; ANSP 25773, from Río Porce, Antioquia; CNHM 63883, from La Ceja, Antioquia; MCZ 15076–100, 24888–93 (+200 dupl.), MZUM 90601, USNM 118243, from Jericó, Antioquia; USNM 152030–1 from Yarumal, Antioquia; MLS 358, from Pacora, Caldas.

Diagnosis.—A small *Hyla* of the *variabilis* group with reduced webbing between the fingers, a pale patagium, and generally with a pair of fairly well developed darker stripes down the back.

This new species is most closely allied to *variabilis* and *columbiana*. From the former it can be distinguished by having a shorter hind leg (heel reaching posterior margin rather than anterior margin of eye), by having the pattern generally of two fairly distinct dark stripes on the back instead of broken lines and blotches, and by having less mottling below. From *columbiana* it differs in its shorter leg and in having a distinct dorsal pattern.

Description of holotype.—Vomerine teeth in two small, rounded patches, lying close together between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border slightly free and unnotched. Snout short, somewhat rounded when viewed from above, nearly truncate in profile, the upper jaw not extending appreciably beyond lower; nostrils more lateral than superior, hardly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal to their distance from eye. Canthus rostralis moderately well defined; loreal region slightly concave and slightly oblique, the upper lip flaring out a little below it. Eye small, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is relatively narrow and slightly less than distance between nostrils. Tympanum fairly distinct, about one-half the diameter of eye, separated from eye by a distance about equal to its own diameter. Fingers with but a trace of web at base, web reaching base of antepenultimate phalanx of third finger, fourth finger considerably longer than second, reaching to disk of third which snugly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, then continuing as a thin margin to base of disk, third and fifth toes subequal, disk of fourth toe covering the tympanic area; a distinct oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel fails to reach posterior margin of eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap slightly. A small

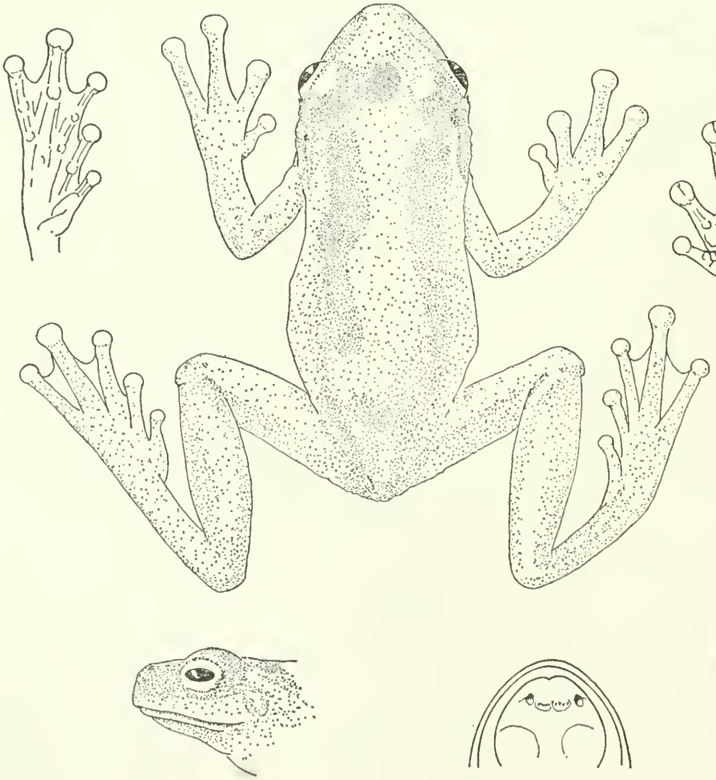

Figure 25.—*Hyla bogerti*, holotype, USNM 118731 (× 2).

patagium extends from the back of upper arm to side of body. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest nearly smooth, that of belly and lower surface of thigh uniformly and finely granular; a rather distinct skinfold across chest; adult gravid female, no vocal sac present. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 33.3 mm.; head length, 10.5 mm.; head width, 10.5 mm.; femur, 14.1 mm.; tibia, 15.2 mm.; heel-to-toe, 21.7 mm.; hand, 8.7 mm.

Color in alcohol.—A pale brown frog with a dorsal pattern of darker brown. The most conspicuous element of the dorsal pattern is a pair of dark stripes, one of which originates back of eye on each side and continues posteriorly to just behind the sacral hump. Each of these stripes is about the width of the upper eyelid. A round dark spot of the same hue lies between the eyes. The canthal region on each side likewise is of this darker hue, and just posterior to the eye, on each side, a band of this darker brown continues through the tympanum to above the shoulder. There are some fuscous flecks on chin and throat, otherwise the ventral surfaces are immaculate, and there are no distinctive markings on the thighs and lower legs although they are pigmented.

Variation.—In the preserved specimens the most striking variation is noted in the ventral markings, in which they range from nearly immaculate to being quite heavily mottled on the chin, throat, and belly, reminiscent of the condition in *variabilis*. While in general the dorsal pattern is made up of two rather discrete dark stripes, there is variation in this. In some specimens the pattern is quite indistinct; whether this is due entirely to natural variation or whether it might be due in part to preservation is not known. In only a few of the specimens where the pattern is discernible are the pair of longitudinal dark stripes on the back interrupted or incomplete. The adults are rather uniform in size. Ten large adults have head-and-body lengths of 30.5, 30.5, 31.0, 31.0, 31.1, 31.6, 31.8, 31.9, 32.3, and 33.5 millimeters. There also is some variation in length of hind leg. In most specimens, when the limb is laid alongside the body the heel reaches only to the posterior margin of eye, but in a few it reaches to the anterior margin.

There seems to be no discernible difference between the specimens from Medellín and those from San Pedro.

Remarks.—This new species represents the northernmost form of a series of small frogs with well-developed patagia that range in the Occidental Andes of Colombia from Cauca to northern Antioquia. Thus we find *columbiana* in Cauca, *variabilis* in Valle, and *bogerti* in Antioquia.

In life, *columbiana* has a patagium that ranges from flesh-colored to red and *variabilis* has one that is flesh-colored to yellowish. We have never seen a live specimen of *bogerti*, so we do not know the color of its patagium, but in preservative it does not seem to be heavily pigmented.

In a way, this chain of species seems to be the ecological equivalent of the three forms (*H. labialis krausi*, *H. l. labialis*, and *H. l. platydactyla*) with brightly colored patagia that range from south to north in the Oriental Andes of Colombia. Of these we have seen only *H. l. labialis* alive; its patagium is bright blue in life rather than reddish or yellowish as seen in *columbiana* and *variabilis*. While both groups do have well-developed patagia and seem to be ecological equivalents, one of the other, we do not imply that they are closely related, for we are not at all sure this is the case.

We take pleasure in naming this species for Dr. Charles M. Bogert, whose kindness in lending material has contributed so much to the present work.

Hyla columbiana Boettger

PLATE 35A–C

1892. *Hyla columbiana* Boettger, p. 41 (type locality, Colombia, Cauca, Popayán).—Mertens, 1922, p. 164.—Nieden, 1923, p. 265.—Rivero, 1964a, p. 303.

1944. *Hyla colombiana*.—Dunn, 1944a, p. 77.

Diagnosis.—A small frog without a distinct pattern on the back, with a well-developed patagium, and with reduced webbing between the fingers.

Hyla columbiana is most closely allied to *variabilis* and *bogerti*. It differs from the former in lacking extensive mottling on the chin, throat, and belly, and from the latter in having a longer leg (the extended heel reaching the anterior rather than posterior margin of eye) and in lacking a well-developed pattern on the back. Preserved specimens sometimes closely resemble *H. minuta* but differ in lacking both the distinct pattern on the back and the transverse white line above the vent and across the base of the heels.

Description.—MLS 192b, Popayán, Cauca, Colombia. Vomerine teeth in two short, transverse series, lying between the small, rounded choanae; tongue one-half as wide as mouth opening, rounded, its posterior border slightly free and unnotched. Snout short, rounded when viewed from above, rounded in profile, the upper jaw extending a little beyond lower; nostrils as lateral as superior, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis weakly defined; loreal region nearly flat and nearly vertical, the upper lip not flaring out below it. Eye moderate, not particularly prominent, its diameter greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance half again as great as the width of upper eyelid, which is about equal the distance between nostrils. Tympanum very indistinct, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base, the web reaching the proximal end of the antepenultimate phalanx of third finger and the base of the penultimate of the second and fourth fingers; fourth considerably longer than second, just reaching to disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe extending as a margin to the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller somewhat indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A small patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult male, vocal sac median, subgular. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 25.5 mm.; head length, 8.3 mm.; head width, 8.3 mm.; femur, 11.2 mm.; tibia, 13.7 mm.; heel-to-toe, 18 mm.; hand, 8.5 mm.

Color in alcohol.—A pale brown frog with a blotch of darker brown on the back. This blotch is rather oblong, with one end between the eyes and the other end anterior to the sacral hump. A deep notch on the posterior end gives the blotch a V-shaped appearance. Faint traces of crossbands are present on the shanks. The thighs are lightly pigmented but without pattern. There is no evidence of the little horizontal white bar above the vent and across the heels that is so characteristic of *H. minuta.* The ventral surfaces are immaculate and a pale dirty brown.

Remarks.—In preservative this species looks superficially rather similar to *H. minuta* but the absence of a superanal white line and distinct pattern on the back will distinguish it from that species on close inspection. When a pattern is present on the back of *columbiana* it is generally asymmetrical. In some specimens no pattern is discernible on the back but in others dark chocolate brown blotches often can be discerned on the light brown dorsal ground color. When present, such blotches are apt to be more prominent anteriorly and sometimes are fused to form a broad shield-like figure on the back, running from between the eyes to the region of the sacral hump. Most often, however, this is broken up into individual blotches. Occasionally smaller discrete blotches occur on the posterior half of the back posterior to the sacral hump. In some specimens the dorsal surfaces of the shanks and feet are crossed with about three fairly distinct dark crossbands; in others the dorsal surfaces of the hind limbs are simply a moderate brown with faint, scattered, pepper-like flecks.

Generally, the ventral surface of this species is immaculate, but in very large females occasionally there are small but distinct vermiculations in dark brown scattered over the undersurface of the throat and belly, but these are never so large, thick, or prominent as they are in *variabilis*.

On July 6, 1961, the junior author had the pleasure of collecting topotypes of this species in company with Dr. Fred Medem and Dr. Carlos Lehman, a grandson of the collector of the type series. In life, the dorsal surface of *H. columbiana* is somewhat golden, with the dorsal blotches a little darker. The patagium of the living individuals is red at night but fades to an orangish hue in daytime.

ANSP 24402 is recorded as having been collected in the vicinity of Bogotá; however, since this specimen is certainly *columbiana* and the species is not known from anywhere in the eastern range of the Andes, the data must be in error.

Specimens Examined

COLOMBIA

Cauca: Popayán, ANSP 25677, CJG 2274–8, CNHM 43933–80, 43982–91, 44050, 44109, 82005–7, MLS 192b, USNM 152081–2, 152146–51; El Tambo, ANSP 25418; Quintana, CNHM 54719.

LOCALITY UNCERTAIN: ANSP 24402.

16. PARVICEPS group

Small, brightly marked frogs with reduced webbing between the fingers, small rounded vomerine teeth patches, and conspicuous markings on the thighs. The following key will help identify the only two species of this group now known from Colombia:

a^1. A small patagium and an oval white spot on the anterior face of the thigh that is bordered in black; belly light . . . . **H. bokermanni**

a^2. No patagium and without a distinct oval spot on the anterior face of each thigh; belly dark . . . . **H. parviceps**

Hyla bokermanni Goin

Figure 26

1960. *Hyla bokermanni* Goin, 1960a, p. 721 (type locality, Tarauaca, Acre, Brazil).

Diagnosis.—A small *Hyla* with reduced webbing between the fingers, small, rounded patches of vomerine teeth, and with a large, oval light spot on the anterior face of the thigh that is surrounded by an ocellus-like dark band.

H. bokermanni is perhaps most closely allied to *H. parviceps*, from which it differs in being of smaller size and in having shorter legs and a different pattern.

Description.—CJG 2355, from Río Manso, Córdoba, Colombia. Vomerine teeth in two small, rounded series, lying on a level with the posterior halves of the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border slightly free and shallowly notched. Snout short, rounded when viewed from above, truncate in profile, the upper jaw barely extending beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about three-fourths their distance from eye. Canthus rostralis moderately defined; loreal region concave and nearly vertical, the upper lip not flaring out strongly below it. Eye moderate, not particularly prominent, its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance nearly twice the width of upper eyelid, which is about equal the distance between

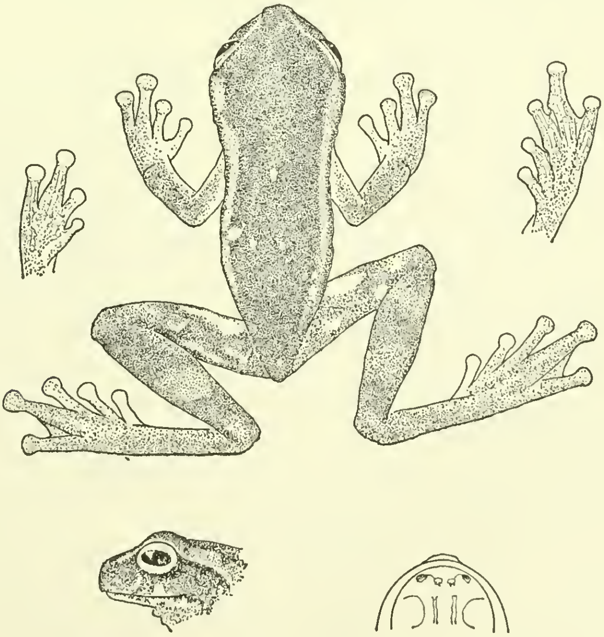

Figure 26.—*Hyla bokermanni*, CJG 2355 (× 2).

nostrils. Tympanum small, not markedly distinct, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers slightly webbed at base, fourth finger longer than second, just reaching to disk of third which covers an area about one-third again as large as the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe just reaching the base of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe snugly covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in post-axillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from the back of upper arm to the side of body. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; distinct traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 24.5 mm.; head length, 7.8 mm.; head width, 8.2 mm.; femur, 12 mm.; tibia, 12.5 mm.; heel-to-toe, 11.8 mm.; hand, 7 mm.

Color in alcohol.—Dorsal ground color dark chocolate brown. A narrow pale stripe passes along the canthus from naris to eye, continuing along the edge of the upper eyelid to behind the eye where it abruptly widens to about the greatest diameter of the tympanum, and continuing posteriorly as a conspicuous dorsolateral stripe to a point about halfway between the sacrum and groin. On each side a narrow white mark extends downward and forward from eye to the edge of upper lip and another wider white band extends downward and backward from eye to the edge of upper lip. The anterior face of each thigh is conspicuously marked with a large oval white spot that is bordered in black. The dorsal and posterior surfaces of thighs are dark but are marked by slightly paler, rounded, lighter blotches. The ventral surfaces are pale.

Variation.—Structurally and in pattern the series of fresh specimens from the Río Manso varies somewhat from the type but whether this is due to the fact that the type died before preservation, or that the type is an immature specimen, or to geographic variation, or a combination of reasons cannot be determined. At any rate, this series differs in having the snout more truncate in profile; the digital disks better developed; the hind leg reaching to the nostril when adpressed instead of just to the eye; the knee and elbow touching when the limbs are laid along the side; a definite patagium; larger size (the type had a head-and-body length of 17.8 mm.); in lacking a white mark on the lip ventral to the naris; in having the dorsolateral light stripe stop abruptly anterior to the groin rather than turning down and passing into the ventral light color of the venter; and in having the tips of the heels pale.

The variation in structure in the series from Río Manso is not noteworthy. The variation in pattern is striking. The only elements of pattern common to all the individuals are the light line on the canthus, the white spots below the eye, the oval white mark surrounded by dark on the anterior face of the thigh, and the clear ventral surfaces. Dorsally the pattern ranges from dark chocolate brown with distinct dorsolateral stripes (like the type and the one described above) to a pale gray dorsum speckled with dusky in which the only semblance of a dorsolateral stripe is a narrow stripe that continues along the upper eyelid posteriorly to above the tympanum. In some specimens the dorsal pattern is a dark brown hour-glass shaped figure running from the eyes to the middle of the back, followed by a broad arched blotch of dark brown. Both of these dark brown marks are on a background of light brown and make a pattern so reminiscent of *Hyla minuta* that the two could be easily confused except for the fact that *H. bokermanni* has the oval spot on the anterior face of the thigh and lacks the white line above the vent and on the heels which is so characteristic of *H. minuta*.

The largest specimen at hand has a head-and-body length of 25 millimeters.

Remarks.—This species is certainly similar to *Hyla rondoniae*, which Bokermann recently described from Rondonia (formerly Guapore) Territory in Brazil, and it may be very close to *H. luteoocellata* Roux, which is described from El Mene, Falcón Province, Venezuela. Until such time as a comparison between specimens of these three nominal forms can be made, we feel it best to leave them as nominal species.

Dr. Medem, who collected the Río Manso series, tells us that these frogs were breeding in a small pond in the woods after the first heavy rain in a week. He said also that the species previously had been unknown to him.

Specimens Examined

COLOMBIA
  Córdoba: Río Manso, CJG 2355–67.
BRAZIL: Acre, Tarauaca, WCAB 2881 (type).

Hyla parviceps Boulenger

PLATE 35D–F

1882. *Hyla parviceps* Boulenger, 1882a, p. 393 (type locality, Ecuador, Sarayacu); 1884a, p. 638.—Nieden, 1926, p. 273.—Melin, 1941, p. 23.—Gorham, 1963, p. 22.

Diagnosis.—A small brown frog with reduced webbing on the fingers, short, rounded vomerine tooth patches, no patagium, a small tympanum, brightly marked thighs, and a distinct light patch on each side below the region of the sacral hump.

Description.—MLS 54, from Ceilan, west of Florencia, Caquetá, Colombia. Vomerine teeth in two short, rounded series, lying close together between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border very slightly free and very shallowly notched. Snout short, rounded when viewed from above, truncate in profile, the upper jaw barely extending beyond lower; nostrils nearly entirely lateral, considerably projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis well defined; loreal region concave and a little oblique, the upper lip flaring out a little below it. Eye large, very prominent, its diameter one-third again as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal width of upper eyelid, which is about equal distance between nostrils. Tympanum small but distinct, about one-third the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web on third finger reaching distal end of antepenultimate phalanx on lateral side and proximal end on medial side; fourth finger longer than second, just reaching to disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the proximal end of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches just beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts smooth; an indistinct narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; traces of a skinfold across chest; gravid adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 21.8 mm.; head length, 7.3 mm.; head width, 7.4 mm.; femur, 11.1 mm.; tibia, 12.6 mm.; heel-to-toe, 15.5 mm; hand, 5.6 mm.

Color in alcohol.—A light brown frog with bright markings on the thighs. The top of head and dorsum are a nearly uniform light brownish except for a ramus of the ventral ground color on each side that starts upward just anterior to the groin, becoming lighter as it rises, and then terminates in a point just below the sacral hump. The thighs are dark in color with distinct yellowish blotches on the anterior and dorsal surfaces and a single yellow spot near the base of each thigh on the posterior surface. The ventral surfaces, including the undersides of hands and feet, are rather heavily pigmented with dark gray.

Remarks.—The few specimens we have seen of this distinctive little frog are rather uniform. The main variation is in the intensity of pigmentation rather than in pattern or structure.

The specimen described above was directly compared with the type in the British Museum and structurally the two were found to be identical. The type has a white blotch on the throat and chest, while the MLS specimen is uniformly dark underneath.

When the described specimen was compared with a specimen from Acre, Brazil (WCAB 2511) the Brazilian specimen was found to differ only in being a little more warty on top of the head and in having a small wart on the apex of each eyelid. The Brazilian specimen, like the type, has a white patch on the chest and anterior part of the belly.

Specimens Examined

COLOMBIA
  AMAZONAS: Río Apaporis, MCZ 28058–9.
  CAQUETÁ: Ceilan, west of Florencia, MLS 54.
BRAZIL: Acre, WCAB 2511.
ECUADOR: Sarayacu, BM 80.12.5.214 [1947.2.13.51] (type); Baños, BM 1889.10.30.9.

17. MARMORATA group

Moderate-sized tree frogs with well-developed, brightly marked patagia and with well-developed ulnar and tarsal ridges. The true status of several nominal forms in this group (*senicula*, *melanargyrea*, *giesleri*) has yet to be determined.

Only one form is at present known from Colombia.

Hyla marmorata (Laurenti)

Plate 36a–c

1768. *Bufo marmoratus* Laurenti, p. 29 (type locality, "Habitat Suriname").
1802. *Hyla marmorata.*—Daudin, 1802, p. 34; 1803, p. 71.—Duméril and Bibron, 1841, p. 571.—Fitzinger, 1843, p. 3.—Günther, 1858, p. 104.—Cope, 1868, p. 111.—Peters, 1871, p. 403.—Boulenger, 1882a, p. 391.—Crawford, 1931, p. 35.—Liu, 1935, p. 34.—Lutz and Kloss, 1952, p. 650.—Cochran, 1955, p. 174.—Rivero, 1961, p. 126.—Gorham, 1963, p. 22.
1820. *Calamita marmorata.*—Merrem, 1820, p. 174.
1838. *Lophopus marmoratus.*—Tschudi, 1838, p. 73.

Diagnosis.—A brightly colored *Hyla* with a large, brightly marked patagium and well-developed ulnar and tarsal ridges.

The combination of brightly marked patagium, distinct ulnar and tarsal ridges, and conspicuously spotted belly should serve at a glance to distinguish *Hyla marmorata* from any other Colombian *Hyla.*

Description.—MLS 55, from Río Orteguaza, La Providencia, Caquetá, Colombia. Vomerine teeth in two short, rounded series, lying close together between the small, rounded choanae; the tooth patches are slightly larger than the choanae; tongue about one-half as wide as mouth opening, somewhat cordiform, its posterior border very slightly free and with a trace of a notch. Snout short, rounded when viewed from above, nearly truncate in profile, the upper jaw extending but little beyond lower; nostrils tiny, more lateral than superior, a little projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal to their distance from eye. Canthus rostralis slightly defined; loreal region flattened and nearly vertical, the upper lip barely flaring out below it. Eye neither large nor particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is about equal to distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed, web extending to the middle of the penultimate phalanx of third finger; fourth finger but slightly longer than second, just reaching to disk of third which just snugly covers the tympanic area; no projecting rudiment of a pollex; a well-developed ulnar ridge. Toes nearly completely webbed, the web on fourth toe reaching the distal third of the penultimate phalanx, third and fifth toes subequal, disk of fourth toe not quite covering the tympanic area; a distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; an exceptionally well-developed tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap considerably. A large, well-developed patagium extends from back of upper arm to side of body. Skin of upper parts glandular, and somewhat roughened with several well-developed warty protuberances on each side in the region above the posterior termination of the flare of the patagium. On each side the patagium continues to the groin as a thin fold of skin. A well-developed, narrow, glandular ridge encircling upper part of tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and more coarsely granular; a well-developed skinfold across chest; adult male, vocal sac hardly apparent. Skin of head not coossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 35.5 mm.; head length, 10.8 mm.; head width, 11.7 mm.; femur, 17.9 mm.; tibia, 21.5 mm.; heel-to-toe, 26.5 mm.; hand, 11.5 mm.

Color in alcohol.—A strikingly marked frog, dark above and patterned below. The dorsal ground color is very dark brown with a nearly imperceptible dorsal figure of darker brown. This inconspicuous dorsal figure starts at the posterior margin of each eye as a sort of Y-shaped mark, the arms of which come together above the shoulders; the base of the "Y" continues posteriorly to terminate between the sacral hump and the groin. In the middle of the back the base of the Y-shaped mark is very broad and contains a light spot of the paler ground color. The entire surface of the chin, throat, and belly, the undersides of forearms, the anterior, posterior, and ventral surfaces of thighs, the underside of ulnar and tarsal ridges, the patagium, and the webbing on hands and feet are bright yellow. The yellow of the chin, throat, belly, and thighs is thickly covered with very distinct, discrete, rounded, coal-black spots that range from one-half millimeter to two millimeters in diameter. The undersides of forearms, hands (except the webbing), shanks, and feet (except the webbing) are black.

Remarks.—The specimens from just east of the Andes in Colombia and Ecuador seem remarkably uniform.

At least three other nominal forms have been assigned to close relationship with *Hyla marmorata*. Cochran (1955, p. 174) placed *senicula* Cope (type locality, Corcovada, Rio de Janeiro) as a subspecies of *marmorata* and made *dasynota* Günther (type locality, Brazil) a synonym of *senicula*. Rivero (1926, p. 127) considered *melanargyrea* Cope (type locality, Mato Grosso, Brazil) as a subspecies of *marmorata* separate from *senicula*. We recently studied a cotype of *melanargyrea* (ANSP 11216) and the type of *dasynota* (BM 68.11.16.3 [1947.2.31.3]) but we have not seen enough material from intervening localities to be dogmatic about the status of the several nominal forms, although we do agree that *marmorata*, *senicula*, and *melanargyrea* seem to be different and that *dasynota* is probably a direct synonym of *senicula*.

Specimens Examined

COLOMBIA
  CAQUETÁ: La Providencia on Río Orteguaza, MLS 55.
ECUADOR: Napo-Pastaza Province, Río Villano, JAP 3729, EPN 1485; cabeceras del Río Bobonaza, EPN 2601; cabeceras del Río Capanuari, EPN 1431; Río Llushin, north of Arapicos, EPN 2510–2; Alto Napo, San José Viejo de Sumaco, EPN 1812–4; Río Napo, MCZ 4776; "Ecuador," OV 5933.

18. PHLEBODES group

The status and relationships of the numerous "small yellow frogs" so common in South America is impossible to determine at the present time. Only for the sake of convenience do we now recognize three groups of these frogs in Colombia, and we feel certain that intensive and extensive studies of these frogs throughout northern South America will bring about a rearrangement of these groupings.

We set off the *phlebodes* group because it seems to us to be more different from the species in the *microcephala* group than the species in that group are from one another. The species in both of these groups seem to differ trenchantly from *Hyla minuta*. *H. phlebodes* differs from *minuta* in lacking the white bar above the vent and on the heels, and it differs from frogs in the *microcephala* group in having a dorsal pattern consisting of a bar between the eyes and an hour-glass figure on the back.

Hyla phlebodes Stejneger

FIGURE 27

1906. *Hyla phlebodes* Stejneger, p. 817 (type locality, San Carlos, Costa Rica).—Nieden, 1923, p. 253.—Stuart, 1935, p. 39.—Taylor, 1952, p. 888.—Cochran, 1961, p. 57.
1935. *Hyla underwoodi*.—Stuart, 1935, p. 39 (part).

Diagnosis.—A small, yellow frog with a small tympanum (one-third the diameter of eye), little or no pigmentation on thighs, and with the dorsal pattern consisting of a narrow bar between the eyes and an hour-glass shaped mark on the back that is made up of narrow dark lines.

Among the Colombian frogs, *Hyla phlebodes* is probably more closely allied to *microcephala*, *mathiassoni*, and *riveroi*. It differs from *microcephala* in having an hour-glass-shaped pattern rather than longitudinal stripes and in having a rather distinct interocular bar. From *mathiassoni* it can be distinguished by the presence of a dorsal pattern and the absence of conspicuous longitudinal dark lymph glands which run from the region of the shoulder to above the groin on each side. Finally, it differs from *riveroi* in lacking a pattern of dark bars that tend either to be arranged transversely across the back or in scattered blotches.

Description.—CNHM 81856, from Andagoya, Chocó, Colombia. Vomerine teeth in two small, rounded patches, lying between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border slightly free and very shallowly notched. Snout short, somewhat triangular when viewed from above, rather rounded in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis moderately well defined; loreal region nearly flat and nearly vertical, the upper lip not flaring out strongly

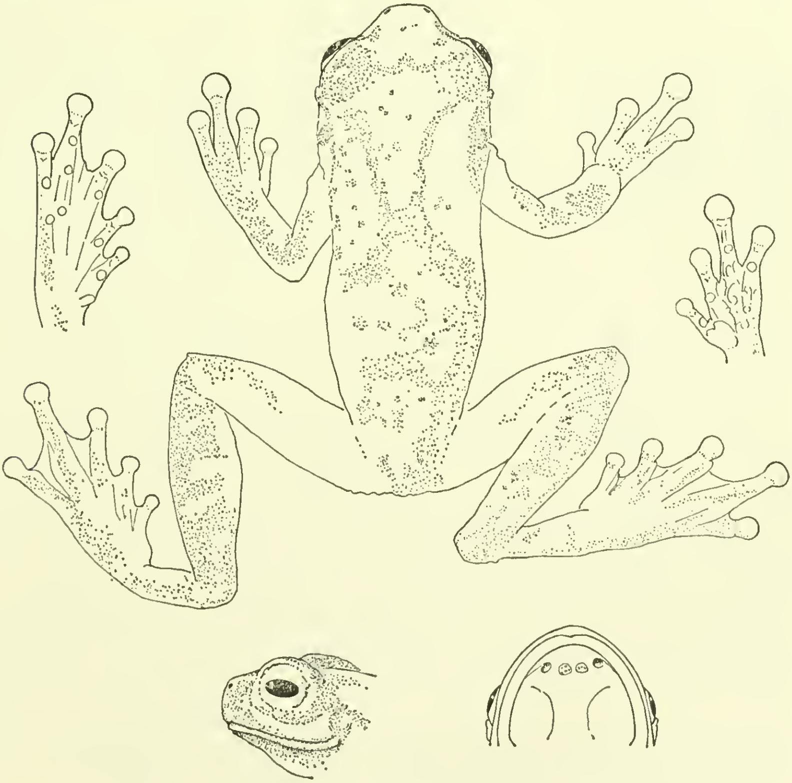

Figure 27.—*Hyla phlebodes*, CNHM 81856 (× 3).

below it. Eye moderate but rather prominent, its diameter greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is in turn about equal the distance between nostrils. Tympanum small but distinct, about one-fourth the diameter of eye, separated from eye by a distance equal to about one-half its own diameter. Fingers webbed at base, the web reaching to distal end of antepenultimate phalanx of third finger; fourth finger slightly longer than second, just reaching to disk of third which is slightly greater than the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the distal end of antepenultimate phalanx; fourth toe about twice as wide at base as other toes; third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to between eye and nostril; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A very weakly developed patagium extends from the back of upper arm to side of body. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; no apparent traces of a skinfold across chest; adult male, vocal sac large, median, subgular. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body length, 21 mm.; head length, 7.7 mm.; head width, 7.3 mm.; femur, 9 mm.; tibia, 11.2 mm.; heel-to-toe, 15.2 mm.; hand, 6.7 mm.

Color in alcohol.—A pale, very light brown frog. The pattern consists of narrow, dark brown pencil-like lines on the dorsum. One such line forms an interocular bar. A rather distinct cruciform mark on the back extends from just behind each eye to a point just anterior to the sacral hump on each side. There are very faint traces of darker crossbars on the shanks. Other than these marks, no pattern is discernible. The venter, like the dorsum, is a very light tannish brown.

Variation.—Except for the degree of fading, the five specimens from Colombia before us are rather uniform. Two males (CNHM 81856; MLS 119) seem to have brighter markings than the females, but this may be due to differences in preservation. When the male from the Maracaibo Basin is compared with the one from the Pacific drainage, no discernible significant variation can be noted.

Remarks.—We have studied the type of *Hyla phlebodes* in Washington and the types of *H. underwoodi* in London and agree with Taylor that Stuart (1935, p. 39) erred in synonymizing *phlebodes* with *underwoodi.*

Specimens Examined

COLOMBIA
  Chocó: Andagoya, CNHM 81856; USNM 152152.
  Norte de Santander: La Selva, USNM 152116–7; Astillero, MLS 119.
COSTA RICA: San Carlos, USNM 29970 (type); Turrialba, MCZ 29224–5, 29310–2.
NICARAGUA: 1.5 m. north of Esteli, MCZ 28933–7.
MEXICO: Yucatán, Chichen Itza, MCZ 2463 (2).

19. MINUTA group

Small, pale to yellowish frogs with a dark saddle on the back and a transverse white line above the vent and on each heel. There is only one species known from Colombia.

Hyla minuta Peters

Plate 36d–f

1872. *Hyla minuta* Peters, 1872b, p. 680 (type locality, near Rio de Janeiro).—Boulenger, 1882a, p. 389.—Baumann, 1912, p. 163.—Nieden, 1923, p. 287.—Miranda-Ribeiro, 1926, p. 89.—Mertens, 1928, p. 298.—Parker, 1933, p. 6; 1934b, p. 123.—Myers, 1945, pp. 13, 31.—Beebe, 1952, p. 174.—Cochran, 1955, p. 119; 1961, p. 57.—Goin, 1958, p. 120.—Stebbins and Hendrickson, 1959, p. 526.—Gans, 1960, p. 301.—Rivero, 1961, p. 133.—B. Lutz, 1954, p. 158.—Bokermann, 1957, p. 496; 1962, p. 81; 1963, pp. 465, 471, figs. 17–21.—Ginés, 1959, p. 122.—Gallardo, 1961b, p. 34.—Gorham, 1963, p. 22.

1887. *Hyla velata* Cope, 1887a, p. 46 (type locality, Chapada, Mato Grosso).—Baumann, 1912, p. 163.—Nieden, 1923, p. 289.—Miranda-Ribeiro, 1926. p. 91.—B. Lutz, 1954, p. 162.

1888. *Hyla bivittata* Boulenger, 1888b, p. 188 (type locality, Lages, Santa Catarina); 1888c, p. 417; 1890, p. 326; 1891a, p. 456.—Nieden, 1923, p. 294.—Miranda-Ribeiro, 1926, p. 82.—De Witte, 1930, p. 227.—B. Lutz, 1954, p. 162.—Cei and Reig, 1961, p. 11.

1912. *Hyla bisittata.*—Baumann, 1912, p. 163.

1925. *Hyla pallens* A. Lutz, p. 212 (type locality, marshes in Rio and neighboring states).—A. Lutz, 1926, pp. 7, 14.—Mertens, 1929, p. 287.—Myers, 1946, pp. 12, 30.—Cochran, 1961, p. 57.—B. Lutz, 1954, p. 161.

1926. *Hyla suturata* Miranda-Ribeiro, p. 93 (type locality, Teresópolis, Rio de Janeiro).—B. Lutz, 1954, p. 161.

1927. *Hyla emrichi* Mertens, p. 1 (type locality, Montserrat, near Porto Alegre, Rio Grande do Sul).—B. Lutz, 1954, p. 161.

Diagnosis.—A small *Hyla* with reduced webs between the fingers and reduced pattern on the thighs, with a modified hour-glass shaped figure on the back and with a transverse white line above the vent that coincides with white lines on the heels when the legs are flexed.

H. minuta may be distinguished from members of both the *leucophyllata* and *microcephala* groups (the other small Colombian hylas with reduced pattern on the thighs) by the distinct transverse white line above the vent and on the heels.

Description.—CNHM 81764, Meta, Villavicencio, Colombia.Vomerine teeth in two small rounded patches lying between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border free and very shallowly notched. Snout short, somewhat rounded when viewed from above, slightly rounded in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis slightly defined; loreal region nearly flat and nearly vertical, the upper lip flaring out but slightly below it. Eye moderate, its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal the distance between nostrils. Tympanum inconspicuous but distinct, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers webbed at base, the web reaching the distal end of antepenultimate phalanx of third finger and to middle of penultimate phalanx of second and fourth fingers; fourth finger longer than second, not quite reaching to disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about three-fourths the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region about equal the greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap considerably. No apparent patagium. Skin of upper parts smooth; a rather narrow indistinct glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 24.3 mm.; head length, 8.2 mm.; head width, 8.6 mm.; femur, 12 mm.; tibia, 14 mm.; heel-to-toe, 20 mm.; hand, 8 mm.

Color in alcohol.—A rather light brown frog with dark brown blotches on the back. In this specimen the main blotch on the back consists of an interocular bar which bears a median posteriorly directed process that broadens out above the shoulders and divides into a broad ypsiloid blotch, the arms of which extend nearly to the sacral humps. There is a single rather broad band across the back about halfway between the sacral humps and the tip of the urostyle. A smaller, less conspicuous blotch occurs on the dorsal surface of the tip of snout. The thighs have scattered, minute pigment spots but have no pattern. Three fairly distinct crossbars occur on each shank, while two less-distinct ones occur on each forearm. As is characteristic of this species, a narrow white horizontal line above the vent is contiguous with similar lines across the bases of the heels when the legs are flexed and the heels held adjacent to the vent. The ventral surfaces are immaculate, now faded to a dirty brownish gray.

Variation.—Most of the variations in the few Colombian specimens at hand involve differences in the shape of the dorsal figure. In three of seven specimens the dorsal figure is essentially the same as that in the specimen figured here and also in the specimen figured by Cochran (1955, pl. 9, E–H). The other four specimens differ in that the main portions of the hour-glass figure between the eyes and across the back are not connected by the narrow longitudinal band of dark pigment, thus leaving a dark band between the eyes and another inverted U-shaped figure across the middle of the back.

Remarks.—Since there has been considerable confusion regarding the status of *H. minuta* in its several forms, we here take the opportunity of bringing the record up to date without trying to make decisions that should be withheld until the species as a whole is studied throughout its range:

1. The type locality of *minuta* is Rio de Janeiro.
2. The dorsal pattern in the Rio population seems to be the hour-glass pattern, usually complete but sometimes with the anterior and posterior parts separate, and usually but not invariably with the dorsal pattern outlined in white.
3. The pattern is quite variable in specimens in southern Brazil, and part of the variation may be correlated with geography. The following additional names have been proposed: *velata* Cope, Mato Grosso; *bivittata* Boulenger, Santa Catarina; *pallens* Lutz, Rio de Janeiro; *emrichi* Mertens, Rio Grande do Sul; and *suturata* Miranda-Ribeiro, Rio de Janeiro.
4. A cotype of *H. goughi* Boulenger described from Trinidad is actually *minuta* (BM 1911.9.8.6 [1947.2.13.83]).
5. *H. minuta* occurs naturally on Trinidad (Parker, 1934, p. 123).
6. The specimens from Colombia and Trinidad seem to be identical, and they lack the white border to the dorsal pattern often seen in southern specimens.
7. Padre Francisco Silverio Pereira, the only person who seems to have studied specimens in life from both the north (Belem) and the south (São Paulo), informs us that the voice is distinctly different in the two populations.

8. Mr. Werner C. A. Bokermann informs us that he cannot distinguish between the voices of the populations in São Paulo, Rio de Janeiro, and Mato Grosso.

Thus, there seems to be no doubt that *Hyla minuta* is a species, like most others in South America, that is in need of detailed study. Until that day, we must once again say *maneat.*

Specimens Examined

COLOMBIA

META: Villavicencio, CJG 2336 (10); CNHM 81764–6; USNM 152108–11

BRAZIL: Bom Successo, Districto Federal, USNM 96197–9 (cotypes of *H. pallens*); Lages, Santa Catarina, BM 88.2.7.26 [1947.2.12.86–91](cotypes of *H. bivittata*).

SURINAME: Onverwacht, CJG 2383.

TRINIDAD: BM 1911.9.8.6 [1947.2.13.83] (cotype of *H. goughi*).

20. MICROCEPHALA group

Small, yellowish frogs with small tympani, reduced webbing between the fingers, small, rounded vomerine tooth patches, and without conspicuous markings on the thighs. The three species now known from Colombia may be differentiated as follows:

*a*¹. Dorsal pattern of four narrow, more-or-less distinct longitudinal dorsal stripes . . . . **H. microcephala**
*a*². Dorsal pattern not of dorsal, longitudinal stripes.
  *b*¹. Dorsum mottled with dark blotches, no conspicuous subdermal lymph sacs . . . . **H. riveroi**
  *b*². Dorsum unmarked, rather conspicuous subdermal lymph sacs. **H. mathiassoni**

Hyla microcephala Cope

FIGURE 28

1886. *Hyla microcephala* Cope, p. 281 (type locality, mountain streams of Chiriquí, Panama).—Günther, 1901, p. 265.—Nieden, 1923, p. 257.—Dunn, 1931, p. 413; 1933, p. 72.—Stebbins and Hendrickson, 1959, p. 524.—Fouquette, 1960a, p. 58; 1960, p. 484.—Rivero, 1964a, p. 302.
1922. *Hyla underwoodi.*—Ruthven, 1922, p. 55.

Diagnosis.—A small yellow frog with a pattern of four dark, narrow, longitudinal dorsal stripes.

H. microcephala apparently is closely related to *mathiassoni* and *riveroi* of Colombia, but its dorsal pattern will distinguish it at once from these two species. *H. mathiassoni* has no dorsal pattern, and while the dorsal pigmentation in *riveroi* may occasionally be arranged in longitudinal rows, there are never more than two such rows and they are curved inward like a pair of reversed parentheses,) (. The absence of an hour-glass pattern on the back will distinguish *microcephala* from *phlebodes.*

Description.—USNM 118248, from eight miles northeast of Salaza, Curumani, Magdalena, Colombia. Vomerine teeth in two small, rounded patches, lying close together between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border slightly free and very shallowly notched. Snout short, somewhat rounded when viewed from above, slightly pointed in profile, the upper jaw extending appreciably beyond lower; nostrils more lateral than superior, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis rather well-defined; loreal region flat and nearly vertical, the upper lip barely flaring out below it. Eye relatively large and prominent, the black choroid coat showing through the translucent upper lid, its diameter greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance equal to distance between nostrils and both greater than width of upper eyelid. Tympanum very distinct, about one-fourth the diameter of

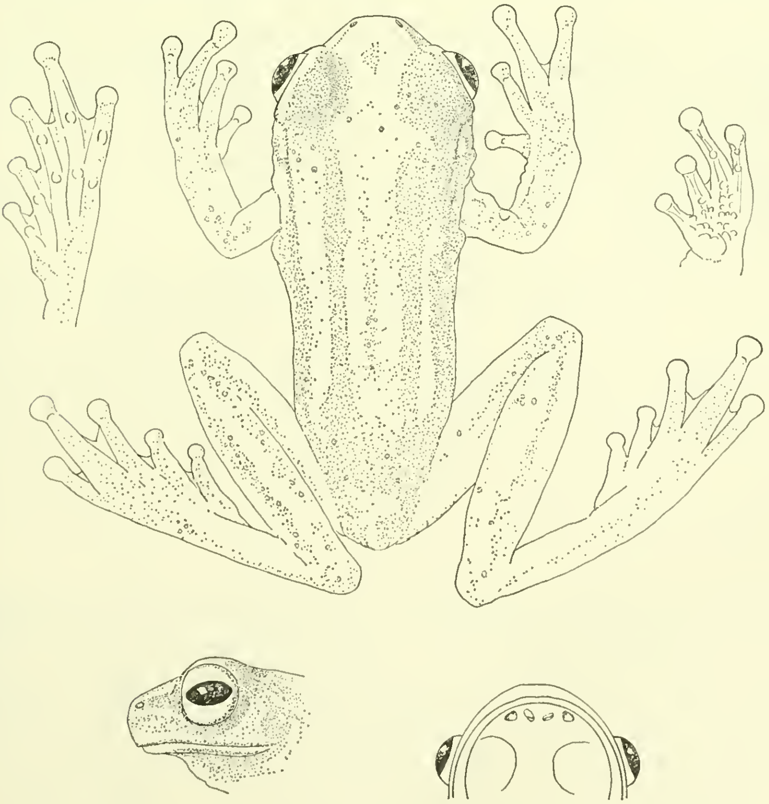

Figure 28.—*Hyla microcephala*, USNM 118248 (× 3).

eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, web on third finger reaching middle of antepenultimate phalanx on lateral side and the base of antepenultimate phalanx on medial side, fourth finger considerably longer than second, reaching to disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe practically covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no outer but a low inner tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a low, rather narrow glandular ridge passes above the tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; traces of a skinfold across chest; adult male, vocal sac subgular, thin, and heavily folded. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 23.6 mm.; head length, 7.5 mm.; head width, 7.5 mm.; femur, 11.8 mm.; tibia, 12.3 mm.; heel-to-toe, 17 mm.; hand, 6.4 mm.

Color in alcohol.—A pale creamy yellow with longitudinal stripes on the dorsum. A median pair of pale brown stripes originate on inner margin of upper eyelids, and each stripe continues back to above the tip of urostyle. The sides of the body are slightly darker than the dorsum, and the pigmentation where the dorsal and lateral side colors meet forms brownish stripes that originate at the posterior corners of the eyes, pass above the tympani, and extend along the sides nearly to the groins. The thighs are immaculate but there are scattered pigment cells on top of arms, shanks, and feet. The ventral surfaces are immaculate.

Variation.—We can discern geographic variation worthy of note in the Colombian specimens of this species. For example, the specimens from around the Fundación-Aracataca region in Magdalena diverge from the typical pattern of *Hyla microcephala* (which consists of four longitudinal dark stripes) as follows: A narrow dark stripe originates on the tip of the snout and passes posteriorly through the eye on each side and then passes straight back above the tympanum and shoulder to terminate in the region of the groin. Another pair of stripes originate between the eyes and pass directly posteriorly, being separated by a distance equal to the interocular space, and terminate above the tip of urostyle. In one of the largest specimens from Aracataca (ANSP 19755, 26.2 mm.), the dark stripe on each side from tip of snout to groin is present but the rest of the dorsum and the top of the head and snout are marked with vermiculations which show hardly a sign of longitudinal arrangement but which do form an indistinct interocular bar, something never seen in Colombian specimens from other localities. Two specimens (MZUM 90168) from Curumaní are likewise larger (24.5 and 28.3 mm. in head-body length) than usual, and one is not so definitely striped as is usual for Colombian individuals.

It seems probable that the above-mentioned specimens simply show the influence of *Hyla misera* from the east. Rivero (1961, pp. 135, 136) points out that true *misera* ranges westward to the vicinity of Sierra de Santa Marta where it seems to blend with *microcephala.* Since we have not seen sufficient material from critical areas to demonstrate intergradation, we presently consider all the material from northeastern Colombia that we have seen as *microcephala* and forego the use of the trinomial.

Another series of specimens of Colombian *microcephala* showing divergence from the typical individual is from Girardot, on the east bank of the Río Magdalena in Cundinamarca opposite the state of Tolima. Specimens in a series (JRT 604–12) from this locality, far up the Magdalena Valley, are smaller in size (19 to 21.9 mm.) and also show a tendency for the dorsal pattern to become modified. In all of these there is a marked tendency for the middorsal pair of stripes to break up into blotches, and in two specimens the dorsal pattern between the lateral stripes is merely a series of blotches, with no middorsal stripes discernible.

Remarks.—We have examined the type of *Hyla underwoodi* (BM 94.11.15.32–3 [1947.2.23.28]) and while we believe that it is certainly close to if not identical with *H. microcephala* we do not believe we can make a definite synonymic assignment without seeing ample fresh material from the type localities of both forms.

Specimens Examined

COLOMBIA

Atlántico: Palmar de Varela, USNM 152143.

Bolívar: Near Gambote, CJG 2444–5; Tolú Viejo, Río Pechelin, CJG 2459; Sincelejo-Tolú, CJG 2457 (20).

Chocó: Atrato, CNHM 74918 (2), 74919.

Cundinamarca: Girardot, JRT 604–12.

Magdalena: Aracataca, ANSP 19755–7; Curumaní, MZUM 90168 (2), USNM 118247–8; Fundación, MZUM 48281–2; El Banco, on Río Magdalena, ANSP 25061.

Santander: 4.7 km. southeast of Bucaramanga, JRT 390–3.

Tolima: Espinal, MCZ 15608; Mariquita, CNHM 81822–3.
No precise locality: ANSP 19749.
PANAMA: Darién, El Real, USNM 140567–8.

Hyla riveroi, new species

Figure 29

1958. *Hyla misera* Goin, p. 120.—Goin and Layne, 1958, p. 104.

Holotype.—CM 37433, collected at Leticia, Amazonas, Colombia, by E. Ross Allen in 1956.

Paratypes.—CJG 2331–2, 2335, MZUM 125428–9, UF 8556 (6), 8557 (4), CM 36085 (12), USNM 146256–7, all from Leticia, Amazonas, Colombia; FM 154 (2), from Quebrada Honda, Sabana de San Juan der Arama, Meta, Colombia; WCAB 1705–8, from Acre, Brazil.

Diagnosis.—A tiny yellow frog allied to *Hyla microcephala.*

The lack of parallel stripes on the back distinguishes *Hyla riveroi* from *H. microcephala;* the mottled dorsal pattern and the lack of conspicuous subdermal lymph sacs in the dorsolateral region distinguish it from *H. mathiassoni;* and the dorsal pattern of crossbars or blotches rather than an hour glass-shaped figure distinguishes it from *H. phlebodes.*

Description of holotype.—Vomerine teeth in two short, rounded series, lying on a level between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly rounded, its posterior border free and slightly notched. Snout short, rounded when viewed from above, slightly rounded in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, somewhat projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis well defined; loreal region concave and nearly vertical, the upper lip flaring out below it only slightly. Eye large, very prominent, its diameter half again as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and about equal the distance between nostrils. Tympanum very distinct, about one-fourth the diameter of eye, separated from eye by a distance about equal to one-third its own diameter. Fingers webbed at base, fourth finger considerably longer than second, just reaching to disk of third which covers about three-fourths the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, web on fourth toe reaching distal end of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body somewhat elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches middle of eye; when limbs are laid along the side, knee and elbow meet snugly; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from the back of upper arm to side of body. Skin of upper parts highly smooth; no distinct narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 20 mm.; head length, 6.4 mm.; head width, 6.4 mm.; femur, 9 mm.; tibia, 10.4 mm.; heel-to-toe, 14.5 mm.; hand, 6.3 mm.

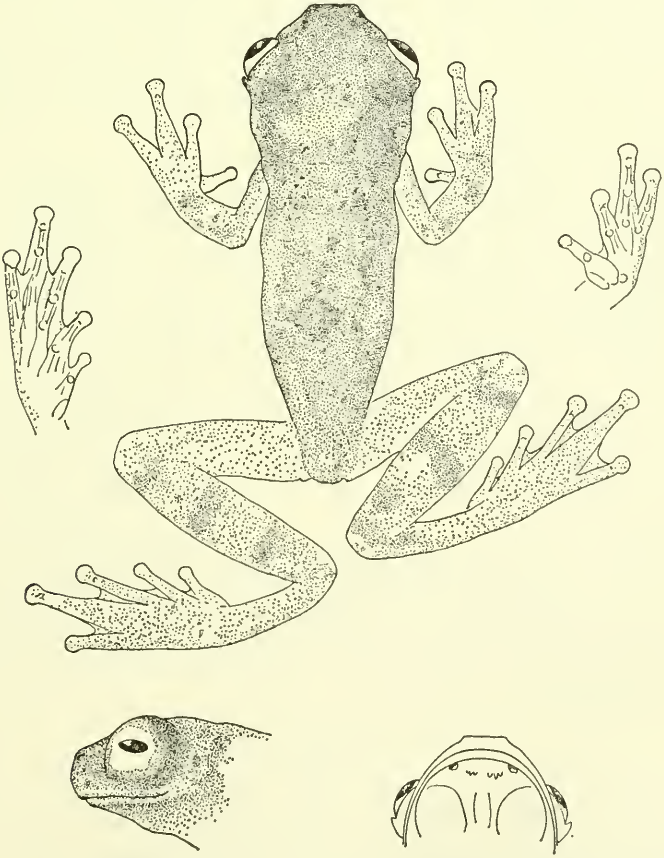

FIGURE 29.—*Hyla riveroi*, holotype, CM 37433 (× 3).

Color in alcohol.—Dorsal ground color ranging from a moderate brown on top of snout to pale brown on top of head and anterior portion of back to a yellowish on hind part of back and along sides. Entire ventral surface a very pale yellow. Tiny brown spots concentrated into a rather indistinct transverse blotch above the scapular region and a rounded blotch above the sacral region. Each shank with three distinct but not well-defined transverse bars across their dorsal surfaces. The upper surfaces of all limbs, including thighs, faintly peppered with minute melanophores but with the pale yellow ground color being the most conspicuous element of the pattern.

Variation.—The type series is rather uniform in structure, but it exhibits a fair amount of variation in dorsal pattern. The dorsal ground color is tan to light brown with a series of dark brown blotches on the back. These blotches range from being asymmetrically arranged to being organized in two somewhat curving, longitudinal rows resembling an hour-glass pattern. There is generally a concentration of pigment on top of the head between the eyes, forming an indistinct to distinct interocular bar. The thighs are nearly immaculate, but the dorsal surfaces of the shanks are generally distinctly crossed by about three blotches of dark brown.

This is one of the smallest species of *Hyla*. The holotype, with a head-body length of 20 millimeters, is the largest known specimen. None of the males examined exceeds 18 millimeters in head-body length.

Remarks.—In using the name "*misera*" for this species, Goin and Layne (1958, p. 104) pointed out that their identification was tentative, pending Dr. Juan Rivero's study of the species. Dr. Rivero now informs us that this frog is undoubtedly distinct from *H. misera* and that it represents an undescribed species. We offered to let Dr. Rivero describe this new species, but since he graciously declined we take this opportunity of dedicating it to him.

The following life history notes are quoted from Goin and Layne (1958, p. 105):

> All specimens were collected in wet cutover land and partially flooded meadows. At a distance the call of the male is a delicate, insect-like tinkle, but close at hand it has a more rasping quality. Calling individuals were invariably located above ground, usually at a height of from two to four feet, in a bush or herbaceous plant. In voice and habits, this species is comparable to *Hyla ocularis* of the southern United States coastal plain.

***Hyla mathiassoni*, new species**

FIGURE 30

1959. *Hyla microcephala.*—Stebbins and Hendrickson, 1959, p. 524.

Holotype.—CNHM 81779, collected at Villavicencio, Meta, Colombia, by Phillip Hershkovitz.

Paratypes.—CNHM 81775–8, MLS 76 (8), USNM 152105–7, 152215–35, CJG 2337–9, all from Villavicencio, Meta; USNM 151962–3, from Río Ariari, south of Villavicencio, Meta; USNM 152066–8, from Florencia, Caquetá.

Diagnosis.—A small yellow frog of the *microcephala* group without a distinct dorsal pattern but with large, dark, dorsolateral lymphatic sacs that show through the dorsal skin and give a superficial appearance of broad dorsolateral stripes.

The absence of a distinct dorsal pattern serves to distinguish *H. mathiassoni* at once from the related species in Colombia—*H. microcephala* and *H. riveroi.* Also, the latter species do not have the conspicuous dorsolateral lymphatic sacs of *mathiassoni.*

Description of holotype.—Vomerine teeth in two small, rounded patches, lying close together between small, rounded choanae; tongue three-fifths as wide as mouth opening, broadly rounded, its posterior border fused and very shallowly notched. Snout short, U-shaped when viewed from above, somewhat pointed in profile, the upper jaw extending considerably beyond lower; nostrils more lateral than superior,

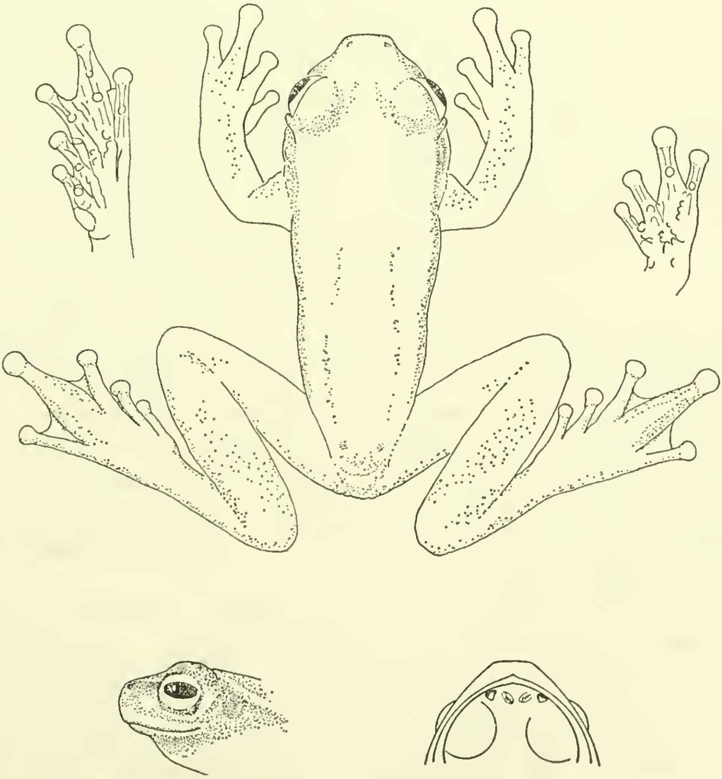

FIGURE 30.—*Hyla mathiassoni,* holotype, CNHM 81779 (×3).

very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis moderately defined; loreal region flat and nearly vertical, the upper lip not flaring out appreciably below it. Eye not large, but prominent due to black choroid coat of eye showing through translucent upper lid; its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is relatively narrow and not as wide as distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base, the web on third finger reaching base of antepenultimate phalanx; fourth finger about equal to second, neither reaching to disk of third; disk of third slightly more than covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a small distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; no outer but a low inner tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow meet; when hind legs are bent at right angles to body, heels overlap considerably. A moderately well-developed patagium extends from the back of upper arm to side of body. Skin of upper parts smooth. A pair of subdermal glandular(?) areas, somewhat lavender in color, give a superficial appearance of pale lavender dorsolateral stripes extending from the region of shoulders to just above groin. A rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; a well-developed skinfold across chest; adult male, vocal sac subgular, finely wrinkled, and greatly distended. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 21.4 mm.; head length, 6.7 mm.; head width, 6.6 mm.; femur, 8.2 mm.; tibia, 10.2 mm.; heel-to-toe, 14.4 mm.; hand, 6.1 mm.

Color in alcohol.—Dorsally and ventrally this specimen is a uniform pale brownish yellow. The loreal regions are slightly pigmented with pale brown, which is most heavily (but still not conspicuously) concentrated along the canthal region. Posterior to the eye this pigment continues as a narrow darkened strip that passes above the tympanum along the side to the sacral region where it fades out. There is no evidence of pigmentation on the limbs or venter.

Variation.—Structurally, the greatest variation seems to be in size. The specimens at hand range in head-body length from 19.5 millimeters in the smallest male to 24.3 millimeters in the largest female. There is, likewise, a variation in the conspicuousness of the dorsolateral subdermal lymph sacs. In most individuals these sacs are very conspicuous, but in others they are much less so; this may be due to thicker or more heavily pigmented skin rather than to less well-developed sacs.

While most of the specimens are without pigment on the back, 14 of the 41 at hand show some degree of dorsal pigmentation. In four specimens this pigmentation simply amounts to tiny, pencil-like flecks scattered more or less over the back, but USNM 152066, from Florencia, the pigment is arranged in a pattern similar to that in *H. phlebodes*. It is impossible to judge whether the variation in pattern of this specimen from Florencia is due to simple geographic variation, whether it represents incipient speciation, or, in fact, whether the Florencia population represents a species other than *H. mathiassoni*.

The lymph sac showing through the skin of the dorsum surely represents the "very pale lavender stripe from snout to groin" as described by Stebbins and Hendrickson (1959, p. 525).

Remarks.—To our knowledge, the only published account pertaining to this species is that of Stebbins and Hendrickson (1959) in which four specimens from Villavicencio are compared with *H. microcephala* from Huila. Stebbins and Hendrickson heard the Villavicencio specimens call shortly after dark on November 18, 1950, and at 10:30 a.m. in bright daylight on November 20. They give the following notes on the life history of the Villaviciencio frogs (Stebbins and Hendrickson, 1959, p. 526):

> A pair found in amplexus at Villavicencio was placed in a container in which the female deposited her eggs. These were laid in a fairly compact, rather smooth-surfaced, ovoid mass, measuring 37 mm. in length, 21 mm. in width, and about 9 mm. in depth. There were approximately 180 eggs, essentially her total complement, since less than a half dozen large ova remained in her oviducts. The ova were about 1 mm. in diameter with the lower quarter cream color and the remainder brown. They were surrounded by a stiff jelly capsule, 1.5 mm. in diameter. Beyond this was a softer jelly that more or less merged with that of adjacent eggs but was set off sharply from the inner capsule. The zones of juncture between the outer capsules were made out with difficulty; there was little tendency for the eggs to separate at these zones.

21. LEUCOPHYLLATA group

This group is composed of small frogs, generally conspicuously patterned, that are characterized by having a patagium, thighs nearly or entirely without pigment, and a pair of oval glandular areas on the chest. There are a dozen or more species in this group in South America, and no less than eight of these are known from Colombia.

Key to Colombian Species in the LEUCOPHYLLATA Group

a^1. Dorsal surface dark with a pattern of light gray or silvery white (in life) light marks.
  b^1. Definitive vomerine teeth.
    c^1. Upper lip below eye not distinctly margined with white . . **H. leucophyllata**
    c^2. Upper lip below eye distinctly margined with white . . . . . **H. ebraccata**
  b^2. No definitive vomerine teeth, or if present, tiny, inconspicuous, and not well developed.
    c^1. A distinct pair of supraocular light spots or such spots fused to form an interocular bar, but rest of top of head not light; dorsolateral light marks restricted to a row of light dots or at most a narrow broken stripe . . . . **H. rossalleni**
    c^2. A light triangular area covering top of head; rather distinct dorsolateral light stripes extending for one-third to one-half the distance to groin along the sides of body . . . . **H. sarayacuensis**
a^2. Dorsal surface plain or with a distinct pattern but without a pattern of silvery white or gray marks.
  b^1. Dorsal pattern obsolete or (in life) made up of bright gold spots.
    c^1. A rather distinct dark brown facial stripe on side of head and loreal region, extending posteriorly through eye and tympanum to taper out along the side; dorsum uniform brownish yellow in life. **H. membranacea**
    c^2. No dark brown stripe on side of face; dorsum with bright gold spots in life . . . . **H. oliveae**
  b^2. Dorsal pattern conspicuous.
    c^1. Dorsal pattern of thickly scattered dark spots, sometimes so thickly placed that the light areas between them form a network of fine lines in a reticulate light pattern . . . . **H. reticulata**
    c^2. Dorsal pattern of dark spots restricted to one or two rows down to middle of back and others, more thickly placed, on top of arms and legs. **H. laynei**

Hyla leucophyllata (Beireis)

FIGURE 31

1783. *Rana leucophyllata* Beireis, p. 182, pl. 11, fig. 4 (type locality, Surinam).—Bonnaterre, 1789, p. 2, pl. 4, fig. 4.—Shaw, 1802, p. 127.
1789. *Rana leucophylla*.—Gmelin, 1789, p. 1055.
1789. *Rana variegata* Bonnaterre, p. 8 (type locality, unknown).
1799. *Calamita leucophyllata*.—Schneider, 1799, p. 168.
1802. *Hyla frontalis* Daudin, p. 17, pl. 7, fig. 1 (type locality, Suriname); 1803, p. 45.
1820. *Calamita leucophyllatus*.—Merrem, 1820, p. 173.
1824. *Hyla elegans* Wied, p. 671 (type locality, Ponte de Gentio on Río Alcobaça); 1824, pl. 85, fig. 1; 1925, p. 529.
1829. *Hyla leucophyllata*.—Gravenhorst, 1829, p. 31.—Duméril and Bibron, 1841, p. 607.—Günther 1858, p. 112; 1901, p. 277.—Steindachner, 1864, p. 243.—Cope, 1868, p. 111; 1870, p. 156; 1871b, p. 222; 1874b,

p. 122.—Boulenger, 1882a, p. 387.—Boettger, 1892, p. 44.—Baumann, 1912, p. 163.—Nieden, 1923, p. 259.—Cott, 1926, p. 1160.—Miranda-Ribeiro, 1926, p. 73, pl. 10, figs. 3, 3a.—Mertens, 1930, p. 162.—De Witte, 1930, p. 227.—Shreve, 1935, p. 215.—Kreig and Forster, 1937, p. 292, fig. 6.—Myers, 1946, pp. 13, 31.—Mertens, 1950, p. 187, fig. 9.—Cochran, 1955, p. 115, pl. 9, figs. A–D.—Goin and Layne, 1958, p. 105.—Gorham, 1963, p. 22.

1838. *Hypsiboas leucophyllatus.*—Tschudi, 1838, p. 72.
1843. *Dendroscophus frontalis.*—Fitzinger, 1843, p. 31.
1869. *Hyla triangulum* Günther, p. 489, pl. 38, fig. 4 (type locality, Brazil).
1870. *Hyla leucophyllata triangulum.*—Cope, p. 55.

Diagnosis.—A member of the *leucophyllata* group with conspicuous light markings dorsally.

The conspicuous light marks on the dorsum that surround a dark rectangular or triangular blotch and the large, white daub that covers the dorsal surface of the shank serve at once to separate this species from both *H. sarayacuensis* and *H. rossalleni.* The absence of a distinct white margin on the upper lip below the eye distinguishes it from *H. ebraccata.*

Description.—MLS 35b, an adult female from Florencia, Caquetá,

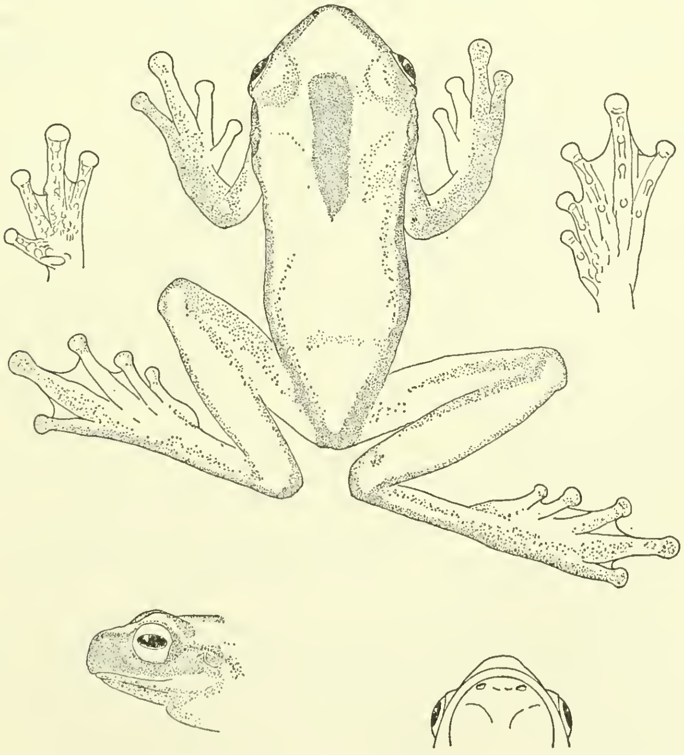

FIGURE 31.—*Hyla leucophyllata,* MLS 35b (× 2).

Colombia. Vomerine teeth in two tiny rounded patches lying between the small, rounded choanae; tongue one-half as wide as mouth opening. broadly cordiform, its posterior border very slightly free and unnotched. Snout short, rounded when viewed from above, truncate in profile, the upper jaw extending but very slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis well defined; loreal region flat and very nearly vertical, the upper lip not flaring out below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance about equal to its own diameter. Fingers webbed at base, web extending to distal third of antepenultimate phalanx of third finger; fourth finger considerably longer than second, just reaching to disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from the back of the upper arm to the side of the body. Skin of upper parts smooth; a glandular ridge encircling upper part of tympanum, then passing downward to terminate above arm; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; a well-developed skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 26.8 mm.; head length, 10.6 mm.; head width, 10 mm.; femur, 13.6 mm.; tibia, 16.1 mm.; heel-to-toe, 21.6 mm.; hand, 9.4 mm.

Color in alcohol.—Dorsally a rich chocolate brown with a distinct pattern of faded creamy white. This dorsal pattern consists of a sharply defined pale white area that extends from the nostrils along the canthus to anterior corner of eye, includes all of upper lid and continues posteriorly from corner of eye above the tympanum to a point just above the vent. An elongate triangular area of the dark ground color is present on the back; the base of the triangle, is between the eyes, and the apex extends posteriorly about halfway to the sacral hump. A conspicuous, light-colored area is present on dorsal surface of each shank, extending from knee to tip of heel. Along the sides the dark dorsal ground color merges gradually with the cadaverish gray ventral color. Pigment on thigh is limited to a trace on the distal portion of dorsal surface.

Remarks.—It is impossible, on the present state of our knowledge, to write an adequate discussion of the variation in *Hyla leucophyllata.* Specimens from Leticia have the pattern that usually is considered rather typical for the species—top of head and dorsum silvery white with a dark rectangular figure extending from between the eyes to region of the sacral hump and a large, silvery white daub completely covering the dorsal surface of the shank. Specimens from Florencia have the rectangular dark spot reduced to an elongate, triangular spot that extends from between the eyes and has its apex reaching about the middle of the back (see Fig. 31). Two specimens (MLS 225–6) from Ceilan, which is just west of Florencia, have the dorsal dark spot completely obliterated so that the entire dorsal surfaces of head, body, shanks (including both knee and heel) and fore arm are white.

Outside of Colombia, the problem of geographic distribution becomes even more complex. Specimens from southeastern Brazil seem to be essentially like those from eastern Colombia, but specimens from the eastern slopes of the Andes in Ecuador and Peru will have to be studied in more detail than previously before a real understanding can be reached. In this region one can find fairly typical examples of *H. leucophyllata,* individuals that match Andersson's description and figure of *H. bifurca,* and, of course, topotypes of *H. sarayacuensis* at Sarayacu. While *bifurca* superficially resembles *leucophyllata,* it differs in that there is no connection between the white above the vent and the white in the dorsolateral lines and in that the white daub is absent from the dorsal surface of the shank and is restricted to a tiny spot on each heel. Since one can find specimens similar to *bifurca* in eastern Ecuador together with *sarayacuensis* and *leucophyllata,* it seems probable that *bifurca* is a valid species.

The type of *Hyla frontalis* is somewhat intermediate in pattern between *bifurca* and *leucophyllata.* In it the white spot above the vent is quite enlarged and nearly, but not quite, comes in contact with the posterior end of the dorsolateral stripes in the region of the sacral hump. Furthermore, the marking of the shank is intermediate, for it has two rather large distinct daubs on each shank—one on the proximal end and one on the distal end—and a tiny daub on the heel. Thus, the top of the shank is not completely covered by a daub as it is in *leucophyllata,* and it is not dark as it is in *bifurca.*

Specimens Examined

COLOMBIA
  AMAZONAS: Leticia, UF 8525 (3), 8526 (2), 8527 (2).
  ANTIOQUIA: Río Sucio, CNHM 82014.
  CAQUETÁ: Florencia, MLS 35b, USNM 152064–5. Ceilan, west of Florencia, MLS 225–6.
  CUNDINAMARCA: Mountains of Medina, northwest of Villavicencio, MCZ 16273–4.
  NO EXACT LOCALITY: Río Putumayo, USNM 152283; no data, MLS 292.
BRAZIL: Acre, WCAB 1262; Amazonas, MCZ 2030; Bonita, Pernambuco, MCZ 2824 (7); Manquinhos, D. F., MCZ 17598.
ECUADOR: Napo-Pastaza: Two km. west of Puerto Napo, JAP 2638; south bank Río Napo, 465 m., JAP 2697, 2745–6; one km. northeast of Tena, JAP 2726.
PERU: Ambyiaca River, MCZ 4477.
SURINAME: MHNP 4868 (type of *H. frontalis*).

***Hyla ebraccata* Cope**

PLATE 37A–C

1874. *Hyla ebraccata* Cope, 1874a, p. 69 (type locality, Nicaragua).—Brocchi, 1881, p. 44.—Taylor and Smith, 1945, p. 587.—Taylor, 1952, p. 885.—Langebartel and Smith 1959, p. 27.—Duellman,1960, p. 40.—Fouquette, 1960c, p. 486.
1942. *Hyla leucophyllata.*—Taylor, 1942, p. 30.

Diagnosis.—A member of the *leucophyllata* group with a white margin on the upper lip just below the eye.

Hyla ebraccata is most similar to *H. leucophyllata,* from which it may be distinguished by having a conspicuous white margin on the upper lip just below the eye and the fact that the dorsal dark blotch, if present, is usually constricted in the middle (and thus dumb-bell shaped) rather than gradually tapering posteriorly as in *leucophyllata.*

Description.—CJG 2369, from Río Manso, Córdoba, Colombia. Vomerine teeth in two widely spaced, rounded series, lying between the small, rounded choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border slightly free and shallowly notched. Snout rounded when viewed from above, slightly rounded in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior and as anterior as lateral, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal to their distance from eye. Canthus rostralis rather well defined; loreal region nearly flat and nearly vertical, the upper lip not flaring out below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal the distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed, the web on the third finger reaching the base of penultimate phalanx on both sides, fourth finger only slightly longer than second, just reaching to disk of third which covers half again the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes almost completely webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe slightly more than covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region about equal to the greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap moderately. A well-developed patagium extends from back of upper arm to side of body. Skin of upper parts smooth; a low, inconspicuous fold encircles upper part of tympanum; skin of throat and chest smooth; that of belly and lower surface of thigh uniformly granular; traces of a skinfold across chest; two distinct, rounded glandular areas in the pectoral region; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 36.8 mm.; head length, 10.7 mm.; head width, 11.7 mm.; femur, 19.6 mm.; tibia, 20.3 mm.; heel-to-toe, 28.9 mm.; hand, 6.4 mm.

Color in alcohol.—Dorsal ground color bluish gray with a superimposed pattern of silvery white. The silvery white pattern is comprised as follows: a triangular area on top of head with the posterior corners of the triangle each continuous with a broad dorsolateral stripe that passes above eye and tympanum and terminates about the level of the sacral hump; a heart-shaped spot on dorsum extending from region of the sacral hump to above the vent; dorsum between the dorsolateral stripes thickly spotted with tiny white spots; a horizontal white streak occurring on each upper jaw and extending from eye to edge of lip. On the anterior limbs there are several small white spots with a larger one just proximal to the wrist. The thighs of hind limbs are without pattern, as is characteristic of frogs of this group; but there is a small white spot on each knee, and on the dorsal surface of each shank is an elongate white daub with a distinct notch on the inner side of each daub, and in each notch there is a small white spot. The lateral surface of the left foot is margined in white. All ventral surfaces are immaculate.

Variation.—As in *Hyla leucophyllata*, there is a marked difference in the size of breeding individuals of the two sexes. Two fresh females from the Río Manso, Córdoba, measure 36.8 and 38 millimeters in head and body length, while the four largest males from the same series (CJG 2368–82) measure 26.3, 27.5, 28, and 29.3 millimeters.

In pattern there is great variation. The female described and figured above is the most gaudy of the lot. In all other specimens from the Río Manso three basic types of pattern are noted. In one type the entire top of the head and dorsum and the tops of the skanks are silvery white. In another the entire top of the head and dorsum and the upper surfaces of the shanks are tan. In the third type the general tone of the dorsal ground color is light brown with a dark brown dorsal figure that begins between the eyes, narrows as it passes posteriorly, then widens and terminates above the sacral hump, thus forming a sort of hour-glass figure on the back. In the female from the Río Sucio, Antioquia, the top of the head and dorsum are white with about a half-dozen small, scattered brown marks on the back and a brown interocular bar. In all of the specimens the white mark on the upper jaw between the lip and the eye is present.

Specimens Examined

COLOMBIA

Antioquia: Río Sucio, CNHM 82014.
Córdoba: Río Manso, CJG 2368–82.

***Hyla sarayacuensis* Shreve**

Figure 32

1935. *Hyla leucophyllata sarayacuensis* Shreve, p. 215 (type locality, Sarayacu, Ecuador).
1955. *Hyla leucophyllata.*—Cochran, 1955, p. 115.
1957. *Hyla sarayacuensis.*—Goin, 1957, p. 60.—Goin and Layne, 1958, p. 106.

Diagnosis.—A brightly colored frog of the *leucophyllata* group with a dorsal pattern of light marks on a dark background.

From *Hyla rossalleni*, which is probably its nearest relative, *H. sarayacuensis* differs in having the dorsolateral stripes complete, in having a triangular pale area on top of the head, and in lacking large, bright, white supraocular spots. From *H. leucophyllata* it differs in lacking a large, distinct, rectangular or triangular spot on the back that is completely surrounded with white and in lacking the large white daub on each leg that nearly covers the dorsal surface of the shank.

Description.—UF 8521-1, an adult male from Leticia, Amazonas, Colombia. Vomerine teeth absent, the choanae small, somewhat oblong; tongue three-fourths as wide as mouth opening, rounded, its posterior border slightly free and shallowly notched. Snout short, rather rounded when viewed from above, truncate in profile, the upper jaw extending but very slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about three-fourths their distance from eye. Canthus rostralis slightly defined; loreal region somewhat rounded and nearly vertical; the upper lip not flaring out below it. Eye large, very prominent, its diameter equal to 1⅓ times its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to one-third its own diameter. Fingers webbed to proximal end of penultimate phalanx of third finger and to middle of penultimate phalanx of fourth; fourth finger considerably longer than second, reaching to base of disk of third which snugly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching distal end of antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about three-fourths the tympanic area; an oval inner and a smaller

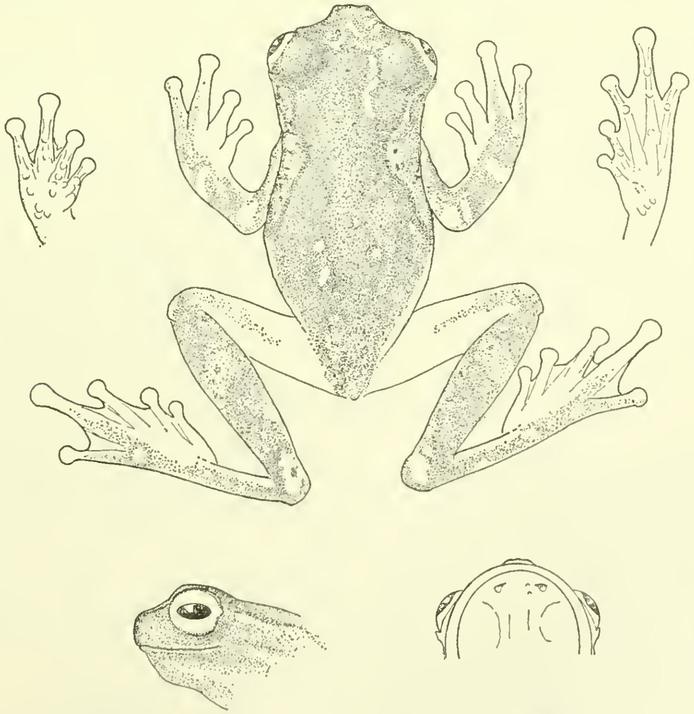

FIGURE 32.—*Hyla sarayacuensis*, UF 8521-1 (× 2).

rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region distinctly but not appreciably narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. A patagium extends from back of upper arm to side of body. Skin of upper parts smooth; a rather narrow glandular ridge encircles the upper part of tympanum; skin of throat and chest smooth except for the pair of pectoral glandular patches which are characteristic of this species; that of belly and lower surface of thigh uniformly and very finely granular; a well-developed skinfold across chest; vocal sac, subgular pouch with longitudinal folds. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 25.6 mm.; head length, 9.4 mm.; head width, 9.1 mm.; femur, 13 mm.; tibia, 14.6 mm.; heel-to-toe, 20.5 mm.; hand, 7.9 mm.

Color in alcohol.—A brightly colored, gaudy frog. In preservative the dorsal ground color is medium brown on which is imposed a pattern of gray (silver in life) markings. There is a very sharp line of demarcation between the dorsal ground color and the completely pigmentless ventral surfaces. The dorsal ground color extends over the entire face, upper lips, top of head, and the posterior margin of the lower jaw. On the back it extends laterally to a line drawn from the posterior edge of the tympanum to the vent. It also covers the dorsal surface of the upper and lower arms, the top of the lateral half of the hand, and extends out onto the lateral two fingers. On the hind limb it is absent from the thigh except for a very narrow streak on the distal end of the dorsal surface. However, it covers the dorsal surface of the crus and the lateral third of the foot and extends out onto the two lateral toes. On this dorsal ground color the following light pattern is imposed: a triangular area on top of the head between the eyes and nostrils; a postocular light stripe which extends posteriorly for nearly half the length of the body; scattered light dots and streaks on the dorsal surface; a light spot on each elbow and wrist; a light spot on each knee, heel, and ankle joint and on the base of the fifth toe; and a crossband on the middle of the crus and the upper segment of the foot.

Variation.—The most conspicuous difference that can be noted in the Colombian specimens is that of size. The head-body length of the larger females ranges from 29 to 34 millimeters while that of the smaller males ranges from 23 to 25 millimeters.

In life the ground color of the dorsum in this species is brownish, while the upper parts are bright salmon pink. A triangular patch on top of the head from the eyes to the nostrils is a creamy white. This light patch is missing in one specimen. A line of similar color extends from behind the eye to about midbody, passing above the tympanum and axilla. In all except two of the Leticia specimens there are two small spots in the sacral region. In the two that do not show this condition, the spots are fused into a dumb-bell shaped figure in one and are not visible at all in the other. There is a definitive spot just above the vent in some specimens, and an aggregation of creamy white flecks in the same position in others. A band of creamy white crosses the shank, and patches of similar color occur on the heel and elbow in all the individuals.

Remarks.—Although obviously related to both *H. leucophyllata* and *H. rossalleni,* this species is just as obviously distinct from both. While about the same size as *leucophyllata* it differs in its more marked sexual dimorphism, in lacking definitive vomerine teeth, and in pattern. In the latter the creamy white markings are so extensive on the dorsum that the impression is given of a light frog with dark markings. In *H. sarayacuensis* the opposite impression is gained, that is, of a dark frog with light markings. Furthermore, *sarayacuensis* never seems to have the large, white, silvery daub on the dorsal surface of the shank that is so characteristic of *leucophyllata.*

H. sarayacuensis differs from *H. rossalleni* in being much larger in size, in having a white, triangular spot on top of the head and snout, in having the dorsolateral stripes more or less complete, and in lacking the bright, silvery white supraocular spots.

All of the Leticia specimens of *H. sarayacuensis* were collected on vegetation in a wet meadow, generally a foot or more above the ground. They were all taken on a single night, and though the same and similar-appearing habitats were worked on other occasions and under seemingly similar conditions, no additional specimens were seen. Three pairs were found in amplexus, each pair on the large leaves of an aroid (Araceae) plant.

Specimens Examined

COLOMBIA

Amazonas: Leticia, UF 8521 (9).

Vaupés: Gino-Gojé, lower Río Apaporis, MCZ 28047.

ECUADOR: Napo-Pastaza: Sarayacu, MCZ 19729 (type of *sarayacuensis*); MCZ 19730 (paratype of *sarayacuensis*); EPN 2975–6, 2979; Río Puyo at Puyo, JAP 2009; 6 km. south-southeast of Puyo, JAP 2055.

Hyla rossalleni Goin

Figure 33

1957. *Hyla alleni* Goin, p. 60 (type locality, Leticia, Amazonas, Colombia).—Goin and Layne, 1958, p. 106.—Gorham, 1963, p. 21.

1959. *Hyla rossalleni* Goin, 1959b, p. 340 (substitute name for *H. alleni,* preoccupied).

Diagnosis.—A small *Hyla* of the *leucophyllata* group with conspicuous supraocular light spots or interocular bar and without a triangular light area on top of the head.

H. rossalleni may be distinguished from *H. sarayacuensis*, its nearest relative, by the presence of the supraocular spots, by having the dorsolateral light stripe broken up into more or less elongate light spots, and by its smaller size. From *H. leucophyllata* it differs by lacking vomerine teeth and by lacking the large white daub which covers the dorsal surface of the crus.

Description.—UF 8501 (holotype), from Leticia, Amazonas, Colombia. Vomerine teeth absent; choanae moderate in size, rounded, and well separated; tongue nearly round, not notched behind and but slightly free behind, its diameter about two-thirds the width of mouth. Head broad, its width greater than distance from snout to occiput; snout nearly rounded as seen from above; upper jaw very slightly projecting. Eyes large and protuberant; diameter of eye greater than the distance from eye to nostril; nostril very near tip of snout; interorbital space about equal to diameter of individual eye. Tympanum distinct but small, not more than one-third the diameter of eye;

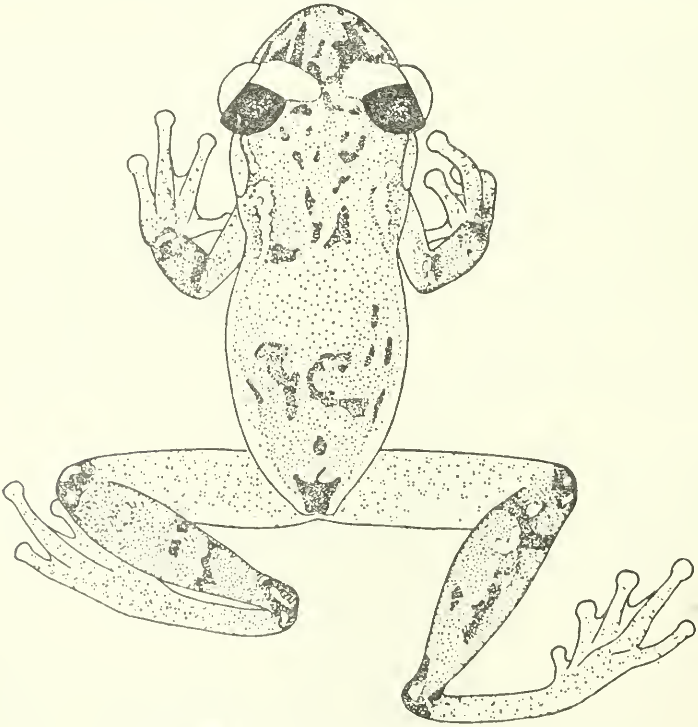

FIGURE 33.—*Hyla rossalleni*, UF 8501 (× 2).

distance from tympanum to eye slightly less than diameter of tympanum; upper eyelids, top of head, and dorsum smooth. Well-developed disks on all fingers and toes; disk of second finger about equal to diameter of tympanum (disk of third finger of left hand partially removed to permit view of terminal phalanx). Fingers not particularly slender; third finger fully webbed for only about one-third its length but a slender margin of web extends distally to base of penultimate phalanx; fingers 3–4–2–1 in order of decreasing length with fingers 4 and 2 being nearly subequal. Toes slender, fully webbed except the fourth toe which has the web extending to base of penultimate phalanx; toes 4–3–5–2–1 in order of decreasing length. Heels slightly overlapping when legs are flexed with femora held at right angles to the body; knees and elbows in contact when limbs are pressed along the side; heel extending to anterior margin of eye when leg is pressed along body. A moderately developed patagium extends from back of upper arm to side of body. Venter and underside of thighs rugose; underside of chin covered by loosely folded, external vocal pouch which is very finely rugose. There is a pair of glandular areas in the skin of the pectoral region. Each area is about 2½ millimeters in diameter and lies just posterior to the insertion of the arm. The areas are separated on the median line by about two millimeters.

Dimensions.—Head and body, 22.8 mm.; head width, 8.3 mm.; tip of snout to posterior margin of tympanum, 7.7 mm.; diameter of eye, 3 mm.; diameter of tympanum, 1 mm.; hind leg (vent to tip of longest toe), 38.5 mm.; hind leg (vent to heel), 22.3 mm.

Color in alcohol.—Ground color above tannish brown, scattered punctulations of darker brown on the back between the eyes and the shoulder region and a similar patch of darker punctulations above the sacral region. Darker pigment is also in evidence on the elbows and in bands across the shank. There is, above each eye, a conspicuous, creamy patch that extends from the free margin of the upper lid down onto the interocular region where it approaches, but does not quite meet, its fellow from the opposite side. Similar creamy white patches make up a short, arched row of light flecks that extends from above the tympanum on each side to above the axilla where it becomes obsolescent. The dorsal surface of the thigh has on it some tannish pigment similar to the dorsal ground color but is nevertheless paler than the dorsum and is without a distinct pattern. The entire ventral surface is immaculate except for a few flecks of dark pigment on each side of the throat near the posterior portion of the lower jaw.

Color in life.—When captured, this specimen was predominately brown above and whitish below. The thighs were salmon pink below and somewhat dusky dorsally. The bars above the eyes and the row of light flecks on each side behind the head were creamy white. A few tiny flecks of a similar nature were present along the shank although these have faded somewhat in preservative.

Remarks.—Although no additional material has been taken in Colombia since the type series was collected, Bokermann has taken some specimens in Acre, Brazil, and was kind enough to send us one for examination. The only noteworthy variation we have seen in specimens is in the supraocular marks. Sometimes these are discrete spots, one on top of each eye, and sometimes they are fused in the midline to form an interocular bar.

Specimens Examined

COLOMBIA
Amazonas: Leticia, UF 8501 (holotype), 8502 (paratype).
BRAZIL: Acre, WCAB 1414.

Hyla membranacea **Andersson**

Plate 37d–f

1945. *Hyla membranacea* Andersson, p. 77 (type locality, Ecuador, Río Pastaza).—Lutz and Kloss, 1952, p. 651.—Goin and Layne, 1958, p. 106.—Gorham, 1963, p. 22.

Diagnosis.—A member of the *leucophyllata* group characterized by a uniform brown dorsum and a dark loreal and postocular band that progressively diminishes along the side as it approaches the groin.

Hyla membranacea is perhaps most similar to *H. oliveae*, from which it differs in lacking gold spots on the back and in having dark loreal regions, a dark postocular stripe, a more triangular head, and a different voice.

Description.—UF 8523, from Leticia, Amazonas, Colombia. Vomerine teeth in two short, rounded series, lying close together between the small, rounded choanae; tongue one-half as wide as mouth opening, broadly cordiform, its posterior border free and with a trace of notch. Snout short, very broadly triangular when viewed from above, slightly rounded in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis slightly defined; loreal region nearly flat and very nearly vertical, the upper lip not flaring out strongly below it. Eye relatively large for a frog this size, its diameter slightly exceeding its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed, the web on third finger reaching base of penultimate phalanx; fourth finger but slightly longer than second, just reaching to disk of third which slightly more than covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth, toes subequal, disk of fourth toe snugly covering the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow touch snugly; when hind legs are bent at right angles to body, heels overlap. A patagium extends from the back of upper arm to side of body. Skin of upper parts smooth; a pair of well-developed, rounded glandular areas in pectoral region; a rather narrow glandular ridge passing above upper part of tympanum; skin of throat and chest finely wrinkled, except for glandular areas mentioned above; that of belly and lower surface of thigh uniformly granular; a well-developed skinfold across chest; adult male, vocal sac apparent only as wrinkled skin in gular region. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 26.3 mm.; head length, 9.4 mm.; head width, 9.4 mm.; femur, 11.7 mm.; tibia, 13.4 mm.; heel-to-toe, 19 mm.; hand, 9.6 mm.

Color in alcohol.—Pale brown above, yellowish gray below. There are several little darker spots on the back but these are so inconspicuous and scattered that in no sense can the specimen be said to have a spotted dorsum. The upper lip and loreal region are dark brown, and this dark brown coloration passes posteriorly through the tympanum and above the shoulder, then continues posteriorly as a progressively fading stripe nearly to the groin. The dorsal surface of both the upper and lower arm is heavily pigmented, as is the upper surface of the shank and foot. The thigh is unpigmented except for a narrow band of pigment along its dorsal surface connecting the pigment of the dorsum with the pigment on the dorsal surface of the shank. Except for the margin of the lower lips, the ventral surfaces are immaculate.

Color in life.—In life all the specimens were an unmarked brownish yellow on the back with a blackish subocular and postocular stripe that extended to the groin as a narrow dusky stripe. The ventral surfaces of the body, the thighs, and the palms and soles were salmon pink. The distended vocal sacs were yellowish white.

Variation.—The four specimens in the University of Florida series are remarkably uniform. They are all males and range in size from 22.7 to 26.3 millimeters. So far as pattern is concerned, there are no noteworthy differences between the individuals.

Life history notes.—The University of Florida specimens were collected while they were calling along the edge of a wet meadow. Two of the four individuals taken were collected from vegetation growing in water along the margin of a stream that bordered the meadow. The other two were collected while they were calling in the meadow proper.

The voice is a loud delibrate cre-e-e-e-e-e-p, cre-e-e-e-e-e-p and very similar to that of *H. leucophyllata.*

Remarks.—Thanks to the kindness of Dr. Alf G. Johnels, we were able to examine the four specimens in the type series and compare them directly with the four fresh specimens from Leticia in the University of Florida collection.

The only appreciable difference between the two series is that of size. The head-body length of the type series ranges from 35.4 to 36.7 millimeters while that of the specimens from Leticia ranges from 22.7 to 26.3 millimeters. Whether this variation is due entirely to sexual difference (the Leticia specimens are all males, the types all females) or whether it may be due in part to geographic variation cannot now be determined. Two specimens in the type series have not faded as much as the others, and in these the same facial mask can be seen exactly as it is in the Leticia specimens. In structural characters such as teeth, size of tympanum, shape of head, tongue, and amount of webbing, no significant differences between the two series can be discerned.

Specimens Examined

COLOMBIA
  AMAZONAS: Leticia, UF 8522–3, 8524 (2).
ECUADOR: Río Pastaza, NR (4 specimens, types of *H. membranacea*).

***Hyla oliveae*, new species**

FIGURE 34

Holotype.—UF 8555, from Leticia, Amazonas, Colombia, collected by E. Ross Allen and James N. Layne on February 23, 1956.

Diagnosis.—A *Hyla* of the *leucophyllata* group with well-developed patagia, pectoral glands, and vomerine teeth. The brown dorsum with gold spots in life seems to be unique.

This new species perhaps is most similar to *H. membranacea,* from which it differs in having the bright gold spots on the dorsum, in lacking dark lores and a dark postocular stripe, in having a more rounded snout, and in voice.

Description of holotype.—Vomerine teeth in two short, indistinct series, lying close together between the small, rounded choanae; tongue three-fourths as wide as mouth opening, very broadly cordiform, its posterior border free and very shallowly notched. Snout short, rounded when viewed from above, slightly pointed in profile, the upper jaw extending beyond lower; nostrils as lateral as superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis rounded, not strongly defined; loreal region a little rounded and nearly vertical, the upper lip not flaring out below it. Eye large and prominent for a frog this size, its long diameter definitely greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base, the web extending to or onto the bases of penultimate phalanges of digits 2, 3, and 4; fourth finger considerably longer than second, just reaching to disk of third which snugly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe very nearly covering the typanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to anterior margin of eye; when limbs are laid along the side, knee and elbow meet snugly; when hind legs are bent at right angles to body, heels overlap. A patagium extends from the back of upper

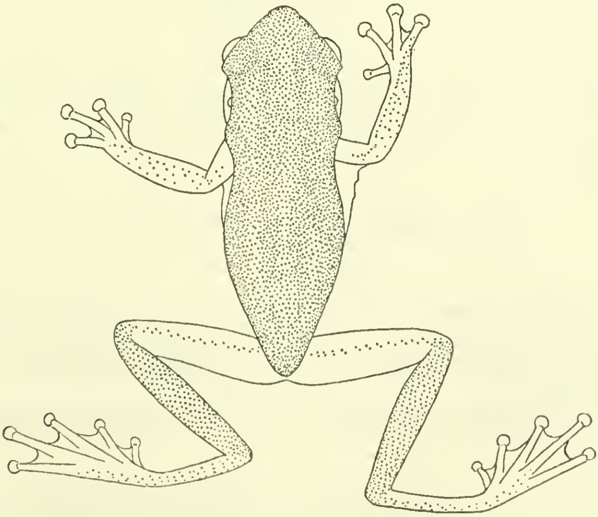

Figure 34.—*Hyla oliveae*, holotype, UF 8555 (× 2).

arm to side of body. Skin of upper parts highly smooth; a pair of rounded glandular areas in the pectoral region; a rather narrow but well-developed glandular ridge encircling upper part of tympanum; skin of throat and chest smooth except for glandular areas mentioned above, that of belly and lower surface of thigh uniformly and very finely granular; a well-developed skinfold across chest; adult male, vocal sac apparent only as a loose gular fold. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 24 mm.; head length, 8.7 mm.; head width, 8.7 mm.; femur, 11 mm.; tibia, 12.5 mm.; heel-to-toe, 16.5 mm.; hand, 6.7 mm.

Color in alcohol.—The specimen is uniform tan on the top of the head and dorsum. The upper surfaces of lower arms, hands, shanks, and the tops of the feet are densely mottled with tan. The thighs are immaculate except for a thin row of tan flecks along the dorsal surface. The upper lip and loreal region are brownish rather than tan; there are a few flecks of tan along the margin of the lower jaw. The ventral surface is otherwise immaculate.

Coloration in life.—When collected this specimen was a rich brown above, dotted with discrete, small golden spots. These golden spots have all but disappeared in preservative.

This specimen was collected in open, wet pasture lands. Its call was loud and *Pseudacris*-like, being comparable to the noise produced by rubbing the teeth of a comb.

Remarks.—The junior author suspected that this specimen was a novelty at the time he described other species from the same collection (Goin, 1957), but he refrained from naming it in the hope that additional material would become available. No one has yet been successful in collecting more specimens and we cannot see that anything is to be gained by withholding the description any longer. We are happy to name this species for Olive Bown Goin, in recognition of the help she has given us on this manuscript.

Hyla reticulata **Jimínez de la Espada**

PLATE 37G–I

1870. *Hyla reticulata* Jimínez de la Espada, p. 61 (type locality, Río Napo, Ecuador); 1875, figs. 7, 7a.—Boulenger, 1882a, p. 386.—Nieden, 1923, p.269.—Myers, 1942, p. 52.—Lutz and Kloss, 1952, p. 652.—Gorham, 1963, p. 23.

1886. *Hyla favosa* Cope, p. 95 (type locality, Pebas, Ecuador).—Nieden, 1923, p. 269.

Diagnosis.—A small frog of the *leucophyllata* group with a dorsal pattern of thickly scattered dark spots that sometimes are so closely placed that the light areas between them form a network of fine lines in a reticulate pattern very reminiscent of the pattern of a giraffe.

H. reticulata may be separated from its nearest relative, *H. laynei*, by the fact that the latter has at most one or two rows of rounded spots down the middle of the back.

Description.—MLS 25, from Ceilan, west of Florencia, Caquetá, Colombia. Vomerine teeth in two small, rounded patches, lying close together between the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border free with a distinct median notch. Snout moderate, rounded when viewed from above, truncate in profile, the upper jaw extending but very slightly beyond lower; nostrils more lateral than superior, not particularly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis slightly defined; loreal region flat and nearly vertical, the upper lip flaring out hardly at all below it. Eye moderate, not prominent, its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal the distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base, web on third finger reaching base of penultimate phalanx, fourth longer than second, reaching to proximal third of disk of third finger which is half again as large as the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the base of the penultimate phalanx, third and fifth subequal, disk of fourth just covering the rounded outer metatarsal tubercle; no outer but an inner tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap appreciably. A well-developed patagium extends from the back of upper arm to side of body. Skin of upper parts smooth; a well-developed narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular; a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 31.8 mm.; head length, 10.8 mm.; head width, 11 mm.; femur, 16 mm.; tibia, 18.5 mm.; heel-to-toe, 26 mm.; hand, 10.2 mm.

Color in alcohol.—The entire dorsal surface—including top of head, loreal regions, upper lips, top of arms, hands, lower legs, and feet—is a pale yellowish gray overlain by large, chocolate brown spots that so closely approach one another that they leave but a reticulated network of the pale ground color. The dorsal pattern is very similar to that of the reticulated giraffe. There is a trace of the pattern on the dorsal margin of thigh but the remainder of thigh is immaculate. All ventral surfaces are a pale cadaverish gray.

Variation.—The six Colombian specimens at hand, all from the same general vicinity west of Florencia, show much variation in dorsal pattern. In two of the specimens the dark spots on the back are placed close together so that the light background between them forms a network of narrow lines; thus, the dorsal pattern is extremely reminiscent of the pattern of a reticulated giraffe. In the other four individuals the dorsal spots are smaller, more rounded, and more widely scattered, giving the impression of a pale frog with dark spots on the dorsum. In the three specimens in which the facial pattern has not faded the reticulate pattern on the side of the face is quite marked, although one specimen has a dorsal pattern of discrete, rounded, dark spots. The pattern in the specimens with the fewest dorsal spots approaches that in *H. laynei* from Leticia, and that species eventually may prove to be a race of *H. reticulata* restricted to the lowlands of the Amazon basin and that typical *reticulata* will be considered a form more characteristic of the eastern slopes of the Andes.

Remarks.—Based on its description, *Hyla favosa* Cope seems to be a synonym of this species, but we have not seen the type of *favosa* and indeed do not know if it is extant.

Specimens Examined

COLOMBIA

Caquetá: Ceilan, west of Florencia, MLS 25, 25a, 25b; Morelia, west of Florencia, ANSP 25415–7.

ECUADOR: Napo-Pastaza: Río Sandalias, EPN 2972; Lagarto Cocha, EPN 2850.

PERU: Pebas, SUNHM 6322–3, 12621. Loreto Department: Yarenacocha, Ucayali Province, CNHM 45434; Río Ucayali, Pucallpa, CNHM 56198.

Hyla laynei Goin

Figure 35

1957. *Hyla laynei* Goin, p. 61 (type locality, Leticia, Amazonas, Colombia).—Goin and Layne, 1958, p. 107.

Diagnosis.—A small, brightly colored frog of the *leucophyllata* group with a pattern of dark rounded spots on a pale brown or tan background.

H. laynei can be distinguished at a glance from all other frogs in this group except *H. reticulata* by the dorsal dark spots. It differs from that species in having only one or two rows of spots down the middle of the back.

Description.—UF 8503 (holotype), from Leticia, Amazonas, Colombia. Vomerine teeth in two small oval patches between the choanae, each patch about the size of a choana, the distance between the patches about equal to the distance between a patch and a choana. Tongue nearly round, very slightly notched and slightly free behind; its diameter about one-half the width of mouth. Head broad, its width slightly greater than distance from snout to occiput; snout somewhat triangular as seen from above with the tip broadly rounded; upper jaw projecting but slightly beyond tip of lower; eyes moderate in size and not pronouncedly protuberant; diameter of eye about equal to distance from eye to nostril; nostril near tip of snout; interorbital space about equal to diameter of individual eye. Tympanum distinct but small, not more than one-third the diameter of eye; distance from eye to tympanum slightly less than diameter of the latter. Upper eyelids, top of head, and dorsum smooth. Well-developed disks on all fingers and toes; disks of second and third fingers about equal to size of the tympanum. Fingers not particularly slender; fingers 2, 3, and 4 webbed to bases of their penultimate phalanges, with a narrow margin of web extending to base of disk of fourth finger; fingers 3–4–2–1 in order of decreasing length. Toes slender, fully webbed except for fourth toe which is webbed to the base of penultimate phalanx; toes 4–3–5–2–1 in order of decreasing length. Heels slightly overlapping when legs are flexed with femora held at right angles to the body; knee and elbow in contact when limbs are pressed

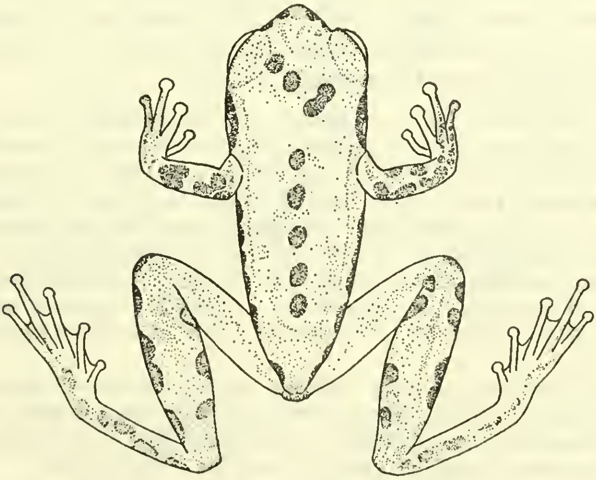

FIGURE 35.—*Hyla laynei*, holotype, UF 8503 (× 2).

along the side; heel extending to anterior margin of eye when leg is pressed along body. A well-developed patagium. Venter strongly rugose, but undersides of thighs and chin nearly smooth; no well-marked external vocal pouch. There is a pair of glandular areas in the skin of pectoral region. Each area is about four millimeters in diameter and lies just posterior to the insertion of arm. The paired glandular areas do not quite meet on the median line.

Color in alcohol.—Ground color on top of head, dorsum, top of arm, and top of shank a light tannish gray; a single median row of dark, chocolate brown spots extends from between the eyes to just posterior to the sacral hump. These spots are roundish and each is about a millimeter, or slightly more, in diameter. A dark stripe of the same nature extends from behind each eye through the tympanum and then breaks up into a row of spots similar to, but slightly smaller than, those on the back, and continues along the side to groin. Dark spots similar to those in the row along the side occur on top of arms, the shanks, and the feet. The upper lip is whitish, and rounded, brownish spots are distributed on the loreal region and upper lip. Brown flecks are distributed along the margin of the lower jaw, otherwise the entire ventral surface is immaculate.

Dimensions.—Head and body, 25.6 mm.; head width, 9.5 mm.; tip of snout to posterior margin of tympanum, 7.8 mm.; diameter of eye, 3 mm.; diameter of tympanum, 1.2 mm.; thigh, 10.9 mm.; shank, 13.1 mm.; heel-to-toe, 15.8 mm.

Color in life.—In life the ground color of the dorsum was yellow and the spots were a rich brown. The hands, feet, and thighs were a bright salmon pink, and the venter was tinged with the same color.

Variation.—Since no additional specimens have been collected since the type series was taken, we quote the comments on variation from the original description (Goin, 1957, p. 61):

> In dorsal ground color one of the paratypes is lighter than the type, the other darker. In the specimen with the lightest ground color the dark brown spots are double at two places along the back and between the eyes, thus giving the impression of a double row of spots down the back. In the darkest specimen the ground color is a light brown and consequently the dark brown spots do not show up quite so prominently. In this specimen there are five spots in the mid-dorsal row, not counting those on top of the head, and the spots are somewhat smaller than in the other two individuals. In life this specimen had a dorsal ground color of tan and the under parts of the abdomen and hind legs were salmon pink.
>
> Structurally there is but little variation amongst the three specimens. The other two do not have the patagium quite so well developed as the type but even in them it is prominent. In none of the three is the external vocal pouch prominent.
>
> Both of the paratypes are 24.7 mm. in head and body length.

Remarks.—The type was collected while the frog was calling in a wet meadow; the two paratypes were taken in grass growing in the water at the edge of a cove of a small stream nearby. The voice is a musical, rattling trill: kle-kle-kle-klee.

For comments on relationships, see the discussion of variation under *Hyla reticulata*.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, UF 8503 (holotype), 8504–5 (paratypes).

22. HOBBSI group

Moderate-sized tree frogs with dark, distinct dorsolateral glandular folds, with the fingers virtually unwebbed, and with the vomerine teeth in an essentially continuous arched series between the choanae. We do not know of any South American tree frogs that are closely related to the single member, *H. hobbsi*.

Hyla hobbsi, new species

FIGURE 36

Holotype.—MCZ 28052, collected along the Caño Guacayá, a tributary of the Río Apaporis, in Amazonas, Colombia.

Paratypes.—MCZ 28053–7, with the same data as the type, and MCZ 28074 from Gino-Gojé, on the Río Apaporis in Vaupés, Colombia

Diagnosis.—A *Hyla* with distinct dorsolateral glandular folds, vomerine teeth usually in a continuous, arched series between the choanae, the fingers virtually unwebbed, and the toes nearly completely webbed. There are scattered, pencil-like black spots on the

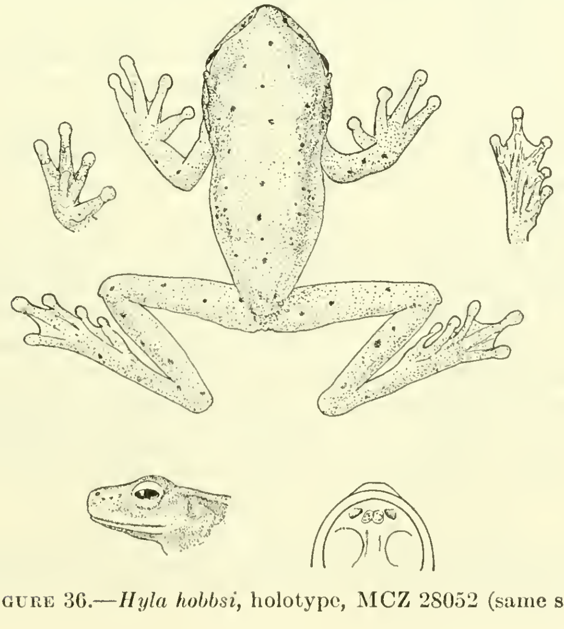

FIGURE 36.—*Hyla hobbsi*, holotype, MCZ 28052 (same size).

dorsal surfaces, and the glandular, dorsolateral folds are nearly black in preservative.

We do not believe that this species is closely related to any known frog. The black, glandular, dorsolateral folds over the shoulders set it off at once from all other tree frogs.

Description of holotype.—Vomerine teeth in a single, continuous series arranged in a curving row with the convex side anterior and lying between the very large, nearly rectangular choanae; tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border fused and distinctly but shallowly notched. Snout moderate, slightly triangular when viewed from above, nearly truncate in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis strongly defined; loreal region concave and oblique, the upper lip flaring out below it. Eye large, prominent, its diameter nearly equal to its distance from tip of snout; palpebral membrane not reticulate; interorbital distance slightly less than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to about two-thirds its own diameter. Fingers with just a trace of web at base, fourth considerably longer than second, just reaching to disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes almost completely webbed, the web on fourth toe reaching middle of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; an indistinct oval inner and a smaller and equally indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body somewhat elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels meet snugly. No patagium. Skin of upper parts smooth; a glandular fold passes above the tympanum and then widens and continues posteriorly to about the level of the adpressed elbows. Skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and distinctly granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 42.5 mm.; head length, 17.2 mm.; head width, 14.7 mm.; femur, 21.6 mm.; tibia, 21.3 mm.; heel-to-toe, 28.8 mm.; hand, 11.2 mm.

Color in alcohol.—Ground color very pale gray above and below. The pattern consists of three elements: the glandular folds above the shoulders, which are black; numerous, widely scattered, dark, pencil-like dots on the dorsal surface; and pale dorsolateral stripes. There are three dorsal dots on each loreal region, three on top of the head, about fifteen scattered over the back, two on the dorsal surface of each arm, three on the dorsal surface of each thigh, four on the left shank and three on the right shank, and two on the left foot and one on the right foot. Each pale, narrow, dorsolateral light stripe originates on the tip of the snout and passes posteriorly above the eye and tympanum and terminates just anterior to the groin. These stripes are very indistinct on this specimen because of its pale ground color.

Variation.—Among the six paratypes, three individuals (MCZ 28053–4 and 28074) are pale gray dorsally, as is the type. The other three specimens are much darker dorsally, although close inspection shows that the same basic dorsal pattern is present in all of the specimens. This variation in intensity of dorsal color probably is not due to preservation alone, for the six specimens in the series (MCZ 28052–7) were all collected and preserved by the same collector at the same time and place. In all except one of the dark specimens (MCZ 28056) are apparent pale dorsolateral stripes that originate at the tip of the snout and pass above the eye and tympanum and terminate in the region of the groin. In the pale specimens these stripes are hardly apparent except where they pass through the dark glandular, dorsolateral fold. In the darker specimens, however, this light stripe stands out distinctly against the dark background. In head and body length, the specimens range from 42.5 millimeters (the type) down to 27.8 millimeters in an immature individual.

Remarks.—We dedicate this species to Dr. Horton H. Hobbs, Jr., of the U.S. National Museum.

Genus *Hyloscirtus* Peters

1882. *Hylonomus* Peters, p. 107 (type species, *Hylonomus bogotensis* Peters (preoccupied by *Hylonomus* Dawson, 1860 [Amphibia, Stegocephalia]).

1882. *Hyloscirtus* Peters, p. 127, type species, *Hylonomus bogotensis* Peters (substitute name for *Hylonomus*, preoccupied).

Diagnosis.—No tympanum or external evidence of ear; rounded sacral diapophyses; a median subgular vocal pouch in male; vomerine teeth behind level of choanae. Life history unknown.

Hyloscirtus bogotensis (Peters)

FIGURE 37

1882. *Hylonomus bogotensis* Peters, p. 107 (type locality, Bogotá, Colombia).

1882. *Hyloscirtus bogotensis.*—Peters, 1882, p. 127 (substitute for *Hylonomus bogotensis*, preoccupied).—Noble, 1917, p. 805.—Nieden, 1923, p. 398.—Dunn, 1944a, p. 73; 1944c, p. 516.—Goin, 1961, p. 12.—Gorham, 1963, p. 23.

Diagnosis.—A hylid tree frog with rounded sacral dispophyses, an inconspicuous tympanum, and the vomerine teeth in transverse series which usually lie well behind the posterior margins of the small, rounded choanae.

Hyloscirtus bogotensis may be separated from the species of *Cryptobatrachus* by the absence of a distinct tympanum; from the species of *Hyla* it may be distinguished by the absence of a distinct tympanum, by having the diapophyses of the sacral vertebrae essentially rounded, and by usually having the vomerine teeth in transverse series behind the choanae.

Description.—MLS 160, from Chipaque, Cundinamarca, Colombia. Vomerine teeth in two transverse series which are slightly more anterior medially, lying close together behind the level of the small, rounded choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border slightly free and slightly notched. Snout moderate, somewhat U-shaped when viewed from above, tip somewhat rounded in profile, the upper jaw extending beyond lower; nostrils lateral, slightly projecting, their distance from

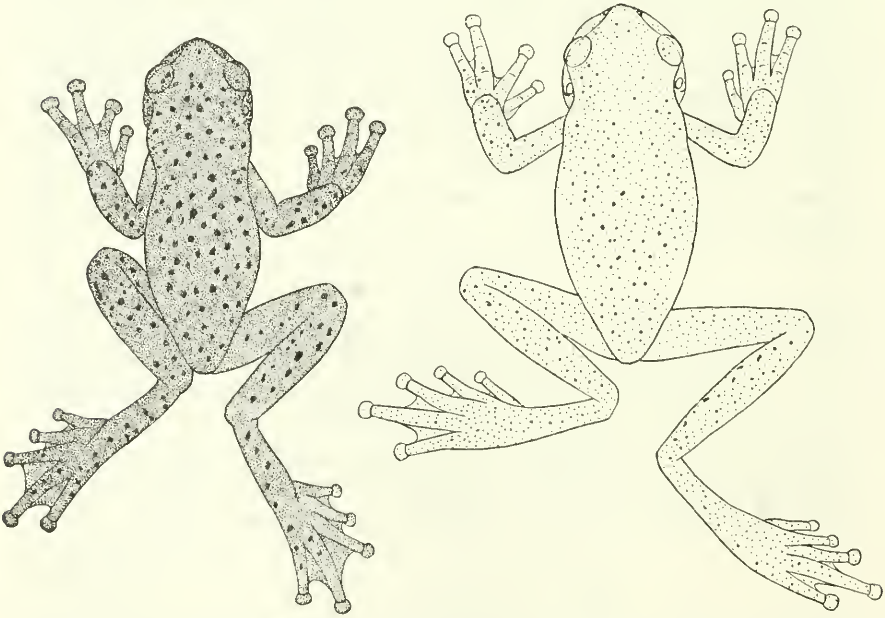

FIGURE 37.—*Hyloscirtus bogotensis:* CNHM 81916, male (at left), and MLS 160, female (both same size).

end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis rather well defined; loreal region slightly concave and nearly vertical, the upper lip flaring out but slightly below it. Eye neither large nor prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal the distance between nostrils. Tympanum slightly distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers webbed at base between fingers 3 and 4 and with a trace of webbing between fingers 2 and 3, fourth finger about one-half disk longer than second, just reaching to disk of third which is about one-third again as great as the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe slightly greater than the tympanic area; a distinct oval inner but no distinct outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches posterior margin of eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap greatly. A trace of a patagium extends from the back of upper arm to side of body. Skin of upper parts smooth; a heavy glandular fold passing above upper part of tympanum, then curving downward to above insertion of arm, where it terminates; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; very faint traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions. Head and body, 48.3 mm.; head length, 14.4 mm.; head width, 15.7 mm.; femur, 21 mm.; tibia, 22.7 mm.; heel-to-toe, 36 mm.; hand, 14.9 mm.

Color in alcohol.—Dorsal ground color a pale grayish brown rather thickly sprinkled with pepper-like black specks. The specks are reduced on the top of head and snout and are less prominent on the dorsal surfaces of thighs and forearms than they are on the dorsal surfaces of the rest of the limbs. The entire ventral surface is a cadaverish gray with faint traces of flecking on the chin and throat.

Color in life.—An adult female (CJG 2299, collected by Alice Hunter) was, in life, a yellowish brown with a definite pattern of more or less uniformly distributed pencil-like black spots on all the dorsal surfaces. All ventral surfaces were a dirty gray without pattern except for faint pepper-like flecks under the throat and a yellowish tinge to the under-margin of the jaws. There was some evidence of metachrosis for the specimen became paler after sitting for a few minutes in a glass jar than it had been when taken from the collecting bag.

Remarks.—To our knowledge, nine specimens of this species have been collected: the type, described by Peters in 1882; a male collected by Dr. and Mrs. Dunn near Bogotá on July 21, 1944; an adult male, (CNHM 81916) from Boquerón Gorge, Bogotá; an adult female (MLS 160) from Chipaque, Cundinamarca; an immature female (CNHM 54776) from El Tambo in Cauca; an adult female (CJG 2299) collected by Alice Hunter in Boquerón Gorge, Bogotá, January 8, 1962; and two adult females and a juvenile (MZUM 123946–8) collected by Hno. Nicéforo María in the vicinity of Bogotá.

We have seen seven of the nine known specimens. As Dunn suspected, the color pattern variation seems to be a result of sexual dimorphism. All of the adult females we have seen are grayish yellow with tiny, scattered black spots above, just as was described for the type. On the other hand, the one male specimen (CNHM 81916, 46 mm.) is generally darker and has the dorsal pigment concentrated into larger, rounded black spots that are scattered over the upper surface just as Dr. Dunn described for the male he collected. Furthermore, this male specimen has a round dark spot under the chin as described by Dr. Dunn for his male. Apparently these differences are purely sexual. The immature female (CNHM 54776, 33.6 mm.) is pigmented just as the adult females.

The structure of the girdle may well imply a relationship with *Cryptobatrachus*, but whether or not the eggs are carried on the back is unknown. The only specimen with known ecological data is the one collected by Dr. Dunn; it was taken from a bromeliad that had grown to about four feet. Dr. Dunn suggested that it might breed in bromeliads and that its tadpoles are modified for that habitat. One adult female (MLS 160) contains what are apparently mature eggs ready for desposition, but no pigment is discernible on them. If the eggs are unpigmented when desposited it would suggest they are deposited in a secluded site. Further studies on the life history of this species may throw further light upon its relationships.

The conspicuousness of the tympanum is apparently partly a function of size, for it is not in evidence in the immature female but is discernible in both adult specimens, although it certainly is not as conspicuous as it is in *Cryptobatrachus*.

Specimens Examined

COLOMBIA

Cauca: El Tambo, CNHM 54776.

Cundinamarca: Boquerón Gorge, Bogotá, CNHM 81916, CJG 2299; vicinity of Bogotá, MZUM 123946–8; Chipaque, MLS 160.

Genus *Osteocephalus* Steindachner

1862. *Osteocephalus* Steindachner, p. 77 (type species, *Osteocephalus taurinus* Steindachner).

Generic diagnosis.—Males with paired vocal pouches; skin on top of head neither thickened nor co-ossified with skull, roof of skull very weakly to markedly exostosed.

Key to Colombian Species of *Osteocephalus*

a^1. Top of head flattened and moderately to heavily exostosed; canthus rostralis nearly straight.
  b^1. Dorsum with numerous, small, spiny warts giving the back a sandpapery effect; top of skull heavily exostosed . . . . **O. taurinus**
  b^2. Dorsum smooth or slightly roughened but not with pronounced sandpapery effect; top of skull moderately exostosed . . . . **O. leprieuri**
a^2. Top of head rounded and not heavily exostosed; canthus rostralis curved. **O. orcesi**

Osteocephalus orcesi (Funkhouser)

FIGURE 38; PLATE 38A–C

1956. *Hyla orcesi* Funkhouser, p. 78 (type locality, Ecuador, Napo-Pastaza Province, Suno drainage, tributary of Río Cotapino, 600 m.)—Gorham, 1963, p. 22.

Diagnosis.—A small *Osteocephalus* with numerous spiny warts on the back which give the dorsum a sandpaper-like effect.

O. orcesi may be distinguished from *O. leprieuri* by the sandpaper-like back and from *O. taurinus* by its smaller size, rounded head, and lack of large exostoses on the skull.

Description.—CNHM 69710, from Acevedo, Río Suazo, near San Adolfo, Huila, Colombia. Vomerine teeth in two short, more or less transverse series, lying close together between the moderate, ovate choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, broader than long, its posterior border slightly free and shallowly notched. Snout moderate, rounded when viewed from above, nearly truncate in profile, the upper jaw extending very little beyond lower; nostrils more lateral than superior, considerably projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis rather well defined; loreal region concave but not particularly oblique, the upper lip flaring out only slightly below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly less than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils.

Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to three-fifths its own diameter. Fingers webbed at base, web on third finger reaching base of penultimate phalanx, fourth finger considerably longer than second, reaching to middle of disk of third which covers about three-fourths the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap considerably. No patagium. Skin of upper parts of head, trunk, legs, and feet thickly covered with small, conical, white-tipped warts, with a few less-distinct warts on the loreal region. A rather narrow glandular ridge encircling upper part of tympanum; skin or throat and chest smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult male,

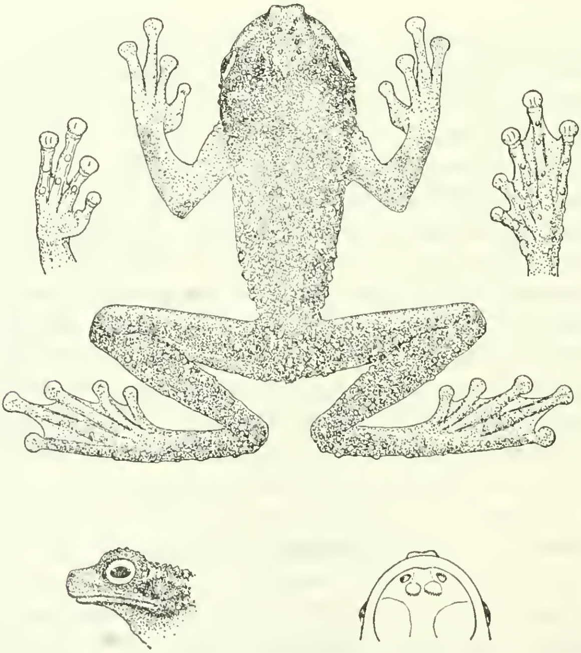

Figure 38.—*Osteocephalus orcesi,* CNHM69 710 (same size). See also Plate 38A–C.

vocal sac at each angle of jaw but apparent only on dissection. Skin of head not co-ossified with skull, roof of skull weakly exostosed.

Dimensions.—Head and body, 48 mm.; head length, 17 mm.; head width, 17.1 mm.; femur, 22.7 mm.; tibia, 27 mm.; heel-to-toe, 35.3 mm.; hand, 14.7 mm.

Color in alcohol.—Very dark brown above with indistinct scattered blotches of deep chocolate brown. A rather distinct series of black, sometimes ocelli-like, spots along each side between axilla and groin. Indistinct crossbars on upper surfaces of arms and legs. Entire ventral surface a dull, dirty brown. The numerous white-tipped warts on the dorsum and top of legs give this individual a speckled appearance.

Remarks.—When we first examined one of the specimens we felt sure we had Melin's *Hyla britti* at hand, but on direct comparison with the type of *britti* the two proved to be different. After studying the type of *Hyla orcesi* (SUNHM 13150) we have no doubt that the specimens at hand are *orcesi* and that *britti* is a different, probably valid, species.

The five specimens we have seen range from 47.3 to 54.6 millimeters in head-body length.

Specimens Examined

COLOMBIA

HUILA: Acevedo, Río Suaza, near San Adolfo, CNHM 69709–10.

ECUADOR: Napo-Pastaza Province, Suno drainage, tributary of Río Cotapino, SUNHM 13150 (type); Abitagua, Oriente, Río Pastaza basin, CNHM 25791, 27619.

***Osteocephalus taurinus* Steindachner**

PLATE 38D–F

1862. *Osteocephalus taurinus* Steindachner, p. 77 (type locality, Río Negro, Brazil).—Boulenger, 1882a, p. 363; 1884a, p. 637.—Goin, 1961, p. 13.

1862. *Osteocephalus flavolineatus* Steindachner, p. 80 (type locality, Cocuy, Brazil).

1867. *Trachycephalus taurinus.*—Steindachner, 1867, p. 64.—Miranda-Ribeiro, 1926, p. 94.—Melin, 1951, p. 38.

1867. *Trachycephalus flavolineatus.*—Steindachner, 1867, p. 64.

1898. *Hyla taurina.*—Boulenger, 1898b, p. 133.—Baumann, 1912, p. 163.—Beebe, 1919, p. 208.—Ruthven, 1919, p. 9.—Nieden, 1923, p. 303.—Lutz, 1927, p. 40.—De Witte, 1930, p. 14.—Crawford, 1931, p. 33.—Parker, 1935, p. 512.—Melin, 1941, p. 38.—Schmidt and Inger, 1951, p. 447.—Lutz and Kloss, 1952, p. 654.—Rivero, 1961, p. 110.

1904. *Hyla taurinus.*—Peracca, 1904, p. 37.

1945. *Hyla depressa* Andersson, p. 73 (type locality, Ecuador, Río Pastaza watershed).—Gorham, 1963, p. 22.

Diagnosis.—A large *Osteocephalus* with the skull strongly exostosed and with numerous small, wart-like spines on the back which give the dorsum a sandpaper-like effect.

O. taurinus may be distinguished from *O. leprieuri* by the presence of numerous, small spines on the back, and from *O. orcesi* by the heavily exostosed skull.

Description.—CNHM 81332, from Meta, Serranía de La Macarena. Vomerine teeth in two heavy /¯¯\ series, lying between the large oblong choanae; tongue one-half as wide as mouth opening, half again as long as wide, somewhat pear-shaped, its posterior border fused and unnotched. Snout moderate, U-shaped when viewed from above, truncate in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region concave but nearly vertical, the upper lip flaring out but slightly below it. Eye large, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance nearly equal to one-fourth its own diameter. Fingers webbed at base, web on third finger reaching middle of antepenultimate phalanx, fourth finger considerably longer than second, just reaching to middle of disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than three-fourths webbed, the web on fourth toe reaching the middle of penultimate phalanx, third and fifth toes subequal, disk of fourth toe nearly covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches well beyond tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts glandular, with numerous, small, rounded, wart-like tubercles. Two very prominent, longitudinal ridges on top of head between the eyes; a few less-well-developed tubercles on upper surfaces of arm and shank; a pronounced, heavy glandular ridge passing above tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult male, vocal sacs paired, one behind each angle of jaw. Skin of head not co-ossified with skull, roof of skull heavily exostosed, with a pair of well-developed longitudinal ridges.

Dimensions.—Head and body, 72.1 mm.; head length, 22.4 mm.; head width, 23.4 mm.; femur, 37.3 mm.; tibia, 43 mm.; heel-to-toe, 52 mm.; hand, 21.8 mm.

Color in alcohol.—A very dark brown frog with just a hint of darker blotches on the back. Three fairly distinct broad crossbands can be seen on each thigh with less-distinct broad crossbands on arms, shanks, and feet. There are faint vermiculations of grayish brown under the chin. The vocal sacs are black. The ventral surface is a dirty brownish gray.

Variation.—There is quite extensive variation in specimens of *O. taurinus.*

We have seen four specimens (NR collection, type of *depressa,* Río Pastaza, Ecuador; ZMU 487 (2), Río Vaupés, Brazil; and BM 1927.-8.1.119, Buenavista, Bolivia) from the western part of the range of *taurinus* that have a conspicuous yellow stripe down the back. This is what Steindachner (1882, p. 64) called *flavolineatus* and Andersson (1945, p. 73) called *depressa.* The specimen (BM 1927.8.1.119) from Buenavista, Bolivia, has a gray rather than brown ground color and in this respect differs from all other specimens of *taurinus* we have seen.

At the other geographic extreme, the largest specimen of *taurinus* we have seen (BM 1905.11.1.20), measuring 93 millimeters in head-body length, is from Chenapoka, British Guiana. We have seen no specimens from the western part of the range that reach this size. The specimen from Chenapoka is heavily peppered with brown on throat and chest, while most western specimens are immaculate or very weakly mottled on those areas.

We have no evidence that any of these variants represent geographic races worthy of nomenclatorial recognition.

Remarks.—The Indians in Vaupés, Colombia, know these frogs by the common name "mamoēn" and use them as food.

Dr. Fred Medem has pointed out to us that, in life, these frogs have green bones.

Specimens Examined

COLOMBIA
Amazonas: Río Apaporis, MCZ 28060.
Meta: Serranía de La Macarena, BM 1956.1.16.2, CNHM 81332.
Putumayo: Río Mecaya, CNHM 69711–4.
Vaupés: Caño Negro, afluente del Cubigú, FM (unnumbered), 7 specimens; Gino-Gojé, Lower Río Apaporis, MCZ 28048.
BOLIVIA: Buenavista, BM 1927.8.1.119.
BRAZIL: Río Vaupés, ZMU 487 (2).
BRITISH GUIANA: Chenapoka, BM 1905.11.1.20–21; Demerara, BM 1878.12.13.18; Kartabo, USNM 118057.

ECUADOR: Macuma; Moruna-Santiago, EPN 2582; Napo-Pastaza, Río Corrientes, EPN 1336–9, 3811–28; Montalvo, EPN 1344; Río Pucayacu, EPN 1347–8; Río Rutuno, EPN 1393; cabeceras del Río Capahuari, EPN 1430; Pindo, EPN 1522; "Region de Puyo," EPN 1679–80; Río Pindo, EPN 2502–4; mas abajo de Montalvo, EPN 4039; Río Pastaza, NR collection (type of *Hyla depressa*).

PERU: Ayacucho, Sivia on Río Apurimac, CNHM 39853; Huancahamba, BM 1911.12.13.63.

VENEZUELA: Cerro Ya-Pacana, USNM 83947.

Osteocephalus leprieuri (Duméril and Bibron)

Plate 39a–c

1841. *Hyla leprieuri* Duméril and Bibron, p. 553 (type locality, French Guiana, Cayanne).—Günther, 1958, p. 101.—Boulenger, 1882a, p. 361.—Lidth, 1904, p. 94.—Baumann, 1912, p. 163.—Beebe, 1919, p. 208.—Nieden, 1923, p. 305.—Miranda-Ribeiro, 1926, p. 81.—Andersson, 1945, p. 73.—Rivero, 1961, p. 130.

1867. *Hypsiboas leprieuri*.—Cope. 1867, p. 200.

1874. *Osteocephalus planiceps* Cope, 1874b, p. 122 (type locality, Peru, Nauta).—Goin, 1961, p. 13.

1882. *Hyla planiceps*.—Boulenger, 1882a, p. 364.—Nieden, 1923, p. 306.—Gorham, 1963, p. 22.

1941. *Hyla vilarsi* Melin, p. 40 (type locality, Brazil, Taracua, Río Vaupés).—Gorham 1963, p. 23.

1961. *Osteocephalus leprieuri*.—Goin, 1961, p. 13.

Diagnosis.—A medium-sized *Osteocephalus* with a moderately exostosed skull and a relatively smooth dorsum.

O. leprieuri may be distinguished from *O. orcesi* and *O. taurinus* by having the dorsum smooth instead of sand-papery.

Description.—MCZ 28042, from Vaupés, Colombia. Vomerine teeth in two moderately heavy, transverse series, lying very close together between the rather large, oblong choanae; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border slightly free and very shallowly notched. Snout neither large nor prominent, somewhat rounded when viewed from above, rather pointed in profile, the upper jaw extending considerably beyond lower; nostrils decidedly more lateral than superior, considerably projecting, their distance from end of snout about two-fifths that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis very strongly defined and practically straight; loreal region concave and oblique, the upper lip flaring out moderately below it. Eye neither large nor prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and one-third again as great as the distance between nostrils. Tympanum very distinct, about four-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed at base, fourth finger considerably longer than second, reaching to middle of disk of third which covers about one-half the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts rather smooth; a distinct but narrow glandular ridge passing above tympanum; skin of throat and chest smooth; that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest. Adult gravid female, no vocal sac. Skin of head not co-ossified with skull, roof of skull moderately exostosed.

Dimensions.—Head and body, 54.5 mm.; head length, 18.3 mm.; head width, 17.9 mm.; femur, 27.1 mm.; tibia, 31.2 mm.; heel-to-toe, 38.2 mm.; hand, 17.1 mm.

Color in alcohol.—Dorsum dark brown. A very dark brown (nearly black) facial stripe runs from the tip of snout across the loreal region, through eye and tympanum to fade out above the insertion of arm. Dorsally there is an indistinct dark blotch on top of the head, another somewhat bilobed one above the shoulders, and behind this are a couple of even less distinct transverse bars across the back. The arms, legs, and feet are each crossed with broad, rather distinct dark bands. The entire ventral surface is a cadaverish gray with dusky mottlings present on the lateral portions of chin and throat.

Remarks.—The specimen described and illustrated (MCZ 28042) has been directly compared with the types of *leprieuri*, *planiceps*, and *vilarsi* by the junior author and there seems to be no doubt that all are conspecific. Another specimen (CNHM 69716) has been directly compared with the types of *planiceps* and *vilarsi* and these, likewise, are considered conspecific.

It is not surprising that this wide-ranging species has been described at least three times, and, indeed, it is not unlikely that there are other nominal forms synonymous with it, although we have not as yet seen types of any material other than those mentioned above that we would assign to the synonymy at the present time.

Specimens Examined

COLOMBIA
- Amazonas: Leticia, USNM 152010–1; Puerto Nariño, MLS 16; Río Apaporis, USNM 152139; Río Apaporis, cauda de La Playa, MCZ 28050.
- Meta: "El mico," USNM 152203.
- Putumayo: Río Mecaya, CNHM 69176.
- Vaupés: Gino-Gojé, USNM 152136–8; no precise locality, MCZ 28042.

BRAZIL: Río Vaupés, Taracua, ZMU 448 (type, *vilarsi*).
ECUADOR: Napo-Pastaza: Montalvo, EPN 1341–42; Cabeceras de Río Capahuari, EPN 1387–89; Río Villano, EPN 1488–9; Pindo, EPN 1519–20.
FRENCH GUIANA: Cayenne, MHNP 4629 (type, *leprieuri*).
PERU: Nauta, ANSP 11399 (type, *planiceps*).

Genus *Phrynohyas* Fitzinger

1843. *Phrynohyas* Fitzinger, p. 30 (type species, *Hyla zonata* Spix).

Generic diagnosis.—The frogs of this genus show the following combination of characters: skin of head not co-ossified with skull and roof of skull not exostosed; skin on top of head, nape, and shoulder region thickened; no postorbital process on frontoparietal bone; vomerine teeth in two short series between the rather small, rounded choanae; male with paired, lateral vocal pouches.

Key to Colombian Species of *Phrynohyas*

a^1. Large, uniformly colored, and with a broad head (head width generally greater than 30 mm.) . . . . **P. ingens**

a^2. Moderate-sized, with or without a dorsal pattern, and with a rather narrow head (head width generally less than 30 mm.) . . . . **P. venulosa**

Phrynohyas ingens Duellman

Plate 39d–f

1956. *Phrynohyas ingens* Duellman, p. 22 (type locality, Venezuela, Department of Zulia, Pueblo Nuevo, La Fría).—Goin, 1961, p. 14.—Gorham, 1963, p. 23.
1961. *Hyla tibiatrix ingens*.—Rivero, 1961, p. 131.
1963. *Hyla venulosa ingens*.—Rivero, 1963, p. 11.

Diagnosis.—A large, uniformly colored *Phrynohyas* with a broad head.

The largest specimen of *Phrynohyas venulosa* at hand has a head-body length of 84.5 millimeters and a head width of 27.3 millimeters; the two specimens of *P. ingens* at hand have head-body lengths of 94.5 and 94.6 millimeters and head widths of 31.8 and 33.5 millimeters.

Description.—MLS 265a, from Astillero, Norte de Santander, Colombia. Vomerine teeth in two short, heavy, transverse series, lying between the moderate-sized, rounded choanae; tongue four-fifths as wide as mouth opening, broadly rounded, its posterior border free and with just a hint of a notch. Snout short, not prominent, rounded when viewed from above, tip slightly rounded in profile, the upper jaw extending but little beyond lower; nostrils more lateral than superior, but slightly projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval equal to about three-fourths their distance from eye. Canthus rostralis not strongly defined; loreal region concave and somewhat oblique, the upper lip flaring out distinctly below it. Eye neither large nor prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is slightly greater than distance between nostrils. Tympanum very distinct, about three-fourths the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Fingers webbed at base, web reaching distal third of antepenultimate phalanx of third finger, fourth finger a little longer than second, reaching to middle of disk of third which just snugly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching the middle of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region about equal greatest width of head; when hind leg is adpressed, heel reaches almost to eye; when limbs are laid along the side, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap slightly. No patagium. Skin of upper parts somewhat glandular, skin on top of head and shoulders thicker than skin on back; a distinct glandular ridge passes down at an angle over the tympanum and towards the insertion of arm; skin of throat, chest, belly, and lower surface of thigh uniformly granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 94.5 mm.; head length, 24 mm.; head width, 31.8 mm.; femur, 42.8 mm.; tibia, 46.7 mm.; heel-to-toe, 64.2 mm.; hand, 29.2 mm.

Color in alcohol.—Dorsum pale brown, ventral surfaces a cadaverish gray-brown. At first glance this frog seems to be absolutely uniform in color above, but on close inspection rather widely spaced wart-like pustules on the back can be seen to be darker in color than the rest of the dorsum.

Remarks.—This large species seems to be endemic to the Maracaibo Basin. The two specimens recorded here are the first to be taken in the portion of the basin belonging to Colombia. *P. ingens*, however, does not occur in the Maracaibo Basin to the exclusion of *P. venulosa*, as three of the specimens of *venulosa* that we have seen from Colombia are from Astillero, the same locality that our two specimens of *ingens* are from.

Specimens Examined

COLOMBIA

Norte de Santander: Astillero, MLS 265, 265a.

***Phrynohyas venulosa* (Laurenti)**

Plate 39g–i

1768. *Rana venulosa* Laurenti, p. 31 (type locality restricted by Duellman to Lago Teffé, at the mouth of Río Teffé where it empties into the Río Solimões, Amazonas, Brazil).
1824. *Hyla zonata* Spix, p. 41 (type locality, Amazon Basin).—Peters, 1872, p. 219.
1824. *Hyla bufonia* Spix, p. 42 (type locality, Ecga [=Ega], Amazonas, Brazil).—Peters, 1873, p. 219.
1841. *Hyla venulosa.*—Duméril and Bibron, 1841, p. 560.—Guichenot, 1855, p. 84.—Lichtenstein, 1856, p. 37.—Günther, 1858, p. 104.—Steindachner, 1867, p. 58.—Peters, 1872a, p. 771.—Boulenger, 1882a, p. 364; 1898b, p. 133.—Boettger, 1892, p. 40.—Stejneger, 1901, p. 180.—Peracca, 1904, p. 37.—Baumann, 1912, p. 103.—Beebe, 1919, p. 208; 1952, p. 174.—Proctor, 1921, p. 189.—Nieden, 1923, p. 244.—Miranda-Ribeiro, 1926, p. 76.—Cott, 1926, p. 1164.—Roux, 1926, p. 97.—A. Lutz, 1927, p. 64.—Nicéforo María, 1930, p. 53.—Parker, 1933, p. 6.—Santos, 1942, p. 102.—Lutz and Kloss, 1952, p. 655.—Cochran, 1955, p. 62.
1841. *Hyla vermiculata* Duméril and Bibron, p. 563 (type locality, North America?).
1858. *Hyla lichenosa* Günther, p. 102 (type locality, South America).—Brocchi, 1881, p. 33.
1866. *Scytopis venulosus.*—Cope, 1866a, p. 85; 1887, p. 12.
1867. *Hyla coriacea* Peters, p. 711 (type locality, Suriname?).—Boulenger, 1882, p. 367.—Mole and Urich, 1894, p. 89.—Nieden, 1923, p. 309.—Gorham, 1963, p. 21.
1907. *Hyla resinifictrix* Goeldi, p. 135 (type locality, Pará, Brazil).—Baumann, 1912, p. 105.—Nieden, 1923, p. 303.—Gorham, 1963, p. 23.
1952. *Acrodytes venulosa.*—Taylor, 1952, p. 799.
1956. *Phrynohyas zonata.*—Duellman, 1956, p. 35.—Goin, 1958, p. 120; 1961, p. 14.—Goin and Layne, 1958, p. 112.—Gans, 1960, p. 302.—Gorham, 1963, p. 23.
1961. *Hyla tibiatrix tibiatrix.*—Rivero, 1961, p. 127.
1964. *Hyla venulosa venulosa.*—Rivero, 1964a, p. 302; 1964b, p. 311.

Diagnosis.—A *Phrynohyas* with or without a dark central patch on the dorsum.

P. venulosa may be distinguished from *P. ingens*—the only other species of *Phrynohyas* presently known to occur in Colombia—by its moderate size, the largest specimen at hand having a head-body length of 84.5 millimeters; the smaller of the two specimens of *ingens* at hand has a head-body length of 94.5 millimeters.

Description.—MLS 258a, from Astillero, Norte de Santander, Colombia. Vomerine teeth in two short, transverse series, lying close together between the moderate-sized, rounded choanae; tongue three-fourths as wide as mouth opening, nearly round, its posterior border slightly free and very shallowly notched. Snout moderate, somewhat rounded when viewed from above, broadly rounded in profile, the upper jaw extending slightly beyond lower; nostrils more lateral than superior, somewhat projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis slightly defined; loreal region concave and slightly oblique, the upper lip flaring out a little below it. Eye small, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is about equal to the distance between nostrils. Tympanum very distinct, about three-fourths the diameter of eye, separated from eye by a distance equal to about one-half its own diameter. Fingers webbed at base, web reaching middle of antepenultimate phalanx of third finger, fourth finger about a disk longer than second, reaching to middle of disk of third which just covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes three-fourths webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about four-fifths the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region about equal greatest width of head; when hind leg is adpressed, heel reaches posterior margin of eye; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap very slightly No patagium. Skin of upper parts glandular, with small, rounded, wart-like tubercles scattered over the posterior portion of the back; the thick, glandular skin on top of the head lapping over the upper part of tympanum; skin of throat, chest, belly, and lower surface of thigh coarsely granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head thickened but not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 72.5 mm.; head length, 25.4 mm.; head width, 28.8 mm.; femur, 34.5 mm.; tibia, 38.3 mm.; heel-to-toe, 53.7 mm.; hand, 22.7 mm.

Color in alcohol.—Dorsal ground color light brown with a superimposed pattern of dark brown. The dark pattern consists of a broad band that originates between the eyes, passes posteriorly in a slightly sinusoidal curve to the region of the sacral hump where it abruptly broadens, extending down on the sides; it then begins to taper and terminates above the vent. In the broadened portion of the dark band above the urostyle there is a small, transverse, dumb-bell shaped patch of the lighter dorsal ground color. The thigh, leg, and foot are each crossed by two broad bands of dark brown which are coincident when the legs are flexed. A similar dark brown band crosses each forearm just above the wrist. A stripe of dark brown originates behind each eye and passes posteriorly around (but not through) the tympanum and terminates above the insertion of arm. The ventral ground color is about the same tone of brown as the dorsal ground color.

Variation.—The problem of variation in this species is no nearer solution today than it was when Duellman (1956) published his study. (For a study of the variation outside of Colombia, we refer the reader to Duellman's report.) None of the type localities of the six separate names presently listed as synonyms are within Colombia. In addition to these six available names, there are several other forms now masquerading as *Hyla* which, we suspect, will be referred to the genus *Phrynohyas* when they have been studied.

We note three types of variants in the Colombian material at hand. Two specimens from Astillero and one specimen from Leticia have conspicuous dorsal patterns of dark brown blotches superimposed on a lighter ground color, together with distinct bands across the thighs, shanks, and feet. These apparently are what Duméril and Bibron called *Hyla vermiculata*. Four other specimens, all from La Providencia, Caquetá, seem to represent the variant described by Spix as *H. bufonia*. These four specimens are not only smaller (60.3, 56.0, 44.6, and 42.8 mm. in head-body length) but are also more slender, elegant-looking frogs.

The remaining ten specimens from Colombia now before us are stout-bodied, more or less uniformly brownish frogs. Some have indistinct dark crossbands across the legs, others show no evidence of such markings. A few have faint, small spots on the dorsum. Goin and Layne (1958, p. 112) pointed out that there is a distinct difference in the number of maxillary teeth between specimens from Leticia, in Colombia, and from Trinidad. The number of maxillary teeth on the left side of our four specimens from Leticia ranges from 66 to 78, with a mean of 73.75 and a standard deviation of 5.32; the number of such teeth in three Trinidad specimens ranges from 51 to 56, with a mean of 54 and a standard deviation of 2.65.

Nomenclature.—Rivero (1961, p. 127) apparently was unaware that the International Zoological Commission (1958) placed the trivial name *zonata* Spix (as published in the combination *Hyla zonata*) on the Official Index of Rejected Names in Zoology and suppressed for purposes of priority both *Acrodytes* Fitzinger, 1843, and *tibiatrix* Laurenti, 1768 (as published in the combination *Hyla tibiatrix*); and that it placed *Phrynohyas* Fitzinger, 1843, and *venulosa* Laurenti (as published in the combination *Rana venulosa* Laurenti, 1768) on the List of Specific Names in Zoology. The commission further ruled that the nominal species *Rana venulosa* Laurenti be interpreted by reference to the type specimen of *Hyla zonata* Spix, 1824. Thus, the specific name of this well-known frog becomes officially and finally *Phrynohyas venulosa.*

Remarks.—The skin secretions of this species are quite toxic and we think it pertinent to again quote Ross Allen's field notes that originally were published in Goin and Layne (1958, p. 113):

> While standing guard over our precious bufeo [freshwater porpoise] I heard a chorus of frogs that was new to me, so after midnight I went to the place, which was in a vacant, thickly wooded lot between houses in Leticia in the direction upriver from the basino. When I approached, many stopped calling, but in a few minutes I found one sitting on the edge of a rainwater pool. It appeared toad-like but very alert, turning its head from one side to another. Its vocal sacs were puffed out on the side of the neck and brown-gray in color. Then I grabbed him as he started away and examined him more closely. . . . Its skin on the side was very granulated looking and while I was handling it, it produced a whitish mucus that covered my hand so I put him in my frog sack. My hands had numerous scratches and small cuts and my left index finger a half-inch skinned place, all of which began to burn; and in spite of washing and wiping, it got worse. I went back to camp and tried to wash off the poison and applied unguentine. The index finger and skinned place became fire-red, swollen, and puffed up. The pain kept me awake the first night; the acid-like burn remained along with the swelling for about three days, but my hands then healed without further complications.

As has been pointed out by Lutz and Kloss (1952, p. 656), natives along the Amazon call this the boatman frog in allusion to the fact that its voice resembles the tapping of paddles on the side of a canoe, a technique used by the Indians to maintain the rhythm of the strokes when paddling. Rivero (1961, p. 131) points out that in Venezuela this species has the very appropriate common name "rana lechera."

Specimens Examined

COLOMBIA

Amazonas: Leticia, MLS 263, USNM 152012–6, UF 10021.
Bolívar: Río Viejo, CJG 2298.
Caquetá: La Provindencia, USNM 152047–50; Morelia, ANSP 25313.
Córdoba: Catival, upper Río San Jorge, CNHM 61171; Río Manso, CJG 2441 (16).
Meta: Angostura No. 1, Río Guayabero, USNM 152198; San Juan de Arama, Los Micos, 400 m., CNHM 81328; Villavicencio, USNM 152248, MLS 68.
Norte de Santander: Astillero, MLS 258, 258a, 265b.
Tolima: Espinal, MCZ 15062.
Vaupés: Gino-Gojé, USNM 152140.
State not known: Puerto Yaviya, upper Río Apaporis, USNM 152141.

ECUADOR: El Oro; 76 km. southeast of Buenavista, SUNHM 2569; Napo-Pastaza, Montalvo, EPN 3007–8; Chicherota, EPN 2507–8; Avila, EPN 3013–4.

Genus *Phyllomedusa* Wagler

1830. *Phyllomedusa* Wagler, p. 201 (type species, *Rana bicolor* Boddaert).

Generic diagnosis.—The frogs of this genus are characterized by having the pupil vertical, the palpebral membrane not reticulate, the tongue extensively free behind, and, in most species (all but *bicolor* of the Colombian forms), the first toe longer than the second, and in having very little or no webbing on the feet.

Key to Colombian species of *Phyllomedusa*

- a^1. First toe longer than second.
  - b^1. Posterior surface of thigh brightly patterned with black and white markings, generally no dorsal pigment on tops of fingers.
    - c^1. A distinct row of small white dots on each dorsolateral fold from behind eye to region of sacral hump . . . . **P. blombergi**
    - c^2. No row of distinct white spots along dorsolateral region from behind eye to region of sacral hump . . . . . **P. hypochondrialis hypochondrialis**
  - b^2. Posterior surface of thigh plain or with a pattern but without conspicuous black and white markings, generally dorsal pigment on tops of fingers.
    - c^1. Upper surface of disks on fingers one and two without distinct white caps.
      - d^1. No series of rounded, distinct, white spots in the dorsal ground color along the sides between axilla and groin, or if such spots are present they are much smaller than tympanum.
        - e^1. A distinct pair of white spots below the vent . . . . . . **P. nicefori**
        - c^2. No distinct pair of white spots below the vent . . . . **P. edentula**
      - d^2. Some rather distinct, rounded, white spots in the dorsal ground color along the sides between axilla and groin, these spots about size of tympanum . . . . **P. boliviana**
    - c^2. Upper surface of disks of fingers one and two with distinct white caps. **P. tarsius**
- a^2. First toe shorter than second . . . . **P. bicolor**

Phyllomedusa bicolor (Boddaert)

PLATE 40A–C

1772. *Rana bicolor* Boddaert, p. 19 (type locality, Suriname).—Shaw 1802, p. 126.

1799. *Calamita bicolor.*—Schneider, 1799, p. 156.—Merrem, 1820, p. 170.

1802. *Hyla bicolor.*—Daudin, 1802, p. 22; 1803, p. 40.—Spix, 1824, p. 42.—Fitzinger, 1826, p. 63.—Gravenhorst, 1829, p. 26.—Guérin-Méneville, 1829, pl. 26, fig. 3.—Peters, 1873a, p. 220.

1830. *Pyllomedusa bicolor.*—Wagler, 1830, p. 201.—Tschudi, 1838, p. 70.—Duméril and Bibron, 1841, p. 629.—Günther, 1858, p. 120.—Boulenger, 1882a, p. 427.—Beebe, 1919, p. 208.—Nieden, 1923, p. 337.—Miranda-Ribeiro, 1926, p. 103.—B. Lutz, 1950, p. 601.—Funkhouser, 1957, p. 38.—Goin, 1958, p. 120.—Goin and Layne, 1958, p. 113.—Rivero, 1961, p. 147.—Gorham, 1963, p. 23.

1868. *Phyllomedusa scleroderma* Cope, p. 112 (type locality, Suriname).

Diagnosis.—A large *Phyllomedusa* with the second toe longer than the first, and with fingers and toes unwebbed except for a trace of web between bases of third and fourth toes.

P. bicolor can be distinguished from all other species of *Phyllomedusa* now known from Colombia by having the second toe longer than the first. It can be distinguished from *Agalychnis spurrelli* and *A. calcarifer* by the absence of web between the fingers.

Description.—UF 10020, from Leticia, Amazonas, Colombia. Vomerine teeth in two short, rather heavy series, lying between the rather large, ovate choanae; tongue three-fourths as wide as mouth opening, broadly pear-shaped, its posterior border free and unnotched. Snout short, truncate when viewed from above and truncate in profile, the upper jaw extending beyond lower; nostrils lateral; slightly projecting, their distance from tip of upper jaw about one-half that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region slightly concave and practically vertical, the upper lip not flaring out below it. Eye rather small for a frog of this size, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance twice the width of upper eyelid, which is about equal to distance between nostrils. Tympanum moderately distinct, about three-fifths the diameter of eye, separated from eye by a distance about equal to one-fifth its own diameter. Fingers unwebbed, fourth finger considerably longer than second, reaching middle of disk of third which just covers the tympanic area; no projecting rudiment of a pollex, no ulnar ridge. Toes with just a trace of web at base; second toe longer than first; third and fifth toes subequal; disk of fourth toe covering about two-thirds the tympanic area; a distinct oval inner and a smaller but equally dictinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel fails to reach the tympanum; when limbs are laid along the side, knee and elbow fail to meet, when hind legs are bent at right angles to body, heels overlap slightly. No patagium. Skin of upper parts glandular; low, wide dorsolateral folds extending from behind eye to region of sacral hump, posterior margin of tympanum bordered by what appears to be a broad low-lying process of the dorsolateral fold; skin of throat and chest fairly smooth, that of belly and lower surface of thigh uniformly granular; no traces of a skinfold across chest; adult male, no vocal sac apparent externally. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 110.4 mm.; head length, 33.2 mm.; head width, 43.7 mm.; femur, 42.5 mm.; tibia, 46.1 mm.; heel-to-toe, 73.2 mm.; hand, 35.1 mm.

Color in alcohol.—Very dark gunmetal blue dorsally, cadaverish gray under chin and throat, under the feet, and under lateral portions of forearms, rest of ventral surfaces a dirty, yellowish white. On all places where the dorsal and ventral ground colors meet (except just above the vent and on the lateral surfaces of the forearms and hands and feet) the two ground colors are separated by a very conspicuous row of rounded black-bordered ocelli-like white spots. On the lateral surfaces of forearms, hands, and feet and above the vent the two ground colors are separated by a distinct, black-bordered white line. The line above the vent coincides with the lines on the heels when the legs are flexed. There is a pair of very distinct, black-bordered, round, white spots below the vent. Under the chin there is a small 8-shaped white spot with a black border, and on the chest there is a single round white spot with a black border. The lower lip is margined in part with similar, elongate, black-bordered white markings.

Variation.—The other specimen at hand (CNHM 81929) is an an adult male, measuring 106.5 millimeters in head-body length, that is practically identical to the described specimen except that the dorsal ground color has faded to a moderate bright blue and the subgular and pectoral ocelli are lacking, although there is a small ocellus under the base of each arm.

Remarks.—As has been pointed out (Funkhouser, 1957, p. 39; Goin and Layne, 1958, p. 113), frogs of this species are used by the natives to induce vomiting.

The voice of frogs of this species is a loud nasal snarl.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, CNHM 81929, UF 10020.

Phyllomedusa blombergi Funkhouser

PLATE 40D–F

1957. *Phyllomedusa blombergi* Funkhouser, p. 41 (type locality, Colombia, Putumayo, Río Rumiyacu, Santa Rosa de Sucumbio).—Gorham, 1963, p. 23.

Diagnosis.—A small *Phyllomedusa* with a truncate snout and well-developed parotoid glands and a distinct row of small white dots extending from upper eyelid along dorsolateral fold to sacral hump.

The row of white dots from eye to sacral hump will distinguish *P. blombergi* from all other Colombian species of *Phyllomedusa* at a glance.

Description.—SUNHM 13241 (holotype), from Río Rumiyacu, Santa Rosa de Sucumbio, Putamayo, Colombia. Vomerine teeth in two tiny patches between the somewhat squarish moderate-sized choanae; tongue one-half as wide as mouth opening, elongate, free and very shallowly notched behind. Snout moderate, pointed when viewed from above, truncate in profile, the upper jaw not extending considerably beyond lower; nostrils entirely lateral, very slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal to their distance from eye. Canthus rostralis very sharply defined; loreal region flat and practically vertical, the upper lip not flaring out below it. Eye moderate but prominent, its diameter one-third again as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance greater than width of upper eyelid, which is about equal to its distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from orbit by a distance about equal to one-third its own diameter. Fingers unwebbed, fourth finger longer than second, reaching to middle of disk of third which covers about one-third the tympanic area; no projecting rudiment of a pollex; a weakly developed ulnar ridge. Toes unwebbed, first toe longer than second, fifth a disk longer than third, disk of fourth covering about one-fourth the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; tarsal ridge present; no dermal appendage on heel. Body somewhat elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches middle of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts fairly smooth except for dorsolateral folds that extend from posterior portion of eye to sacral hump and bear a distinct but narrow row of small, rounded pustules, each pigmented a creamy white; a rather narrow glandular ridge encircling upper part of tympanum and extending downward toward shoulder; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; no traces of a skinfold across chest. Possibly a juvenile, sex not determinable, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 34.7 mm.; head length, 13.2 mm.; head width, 11.7 mm.; femur, 13.3 mm.; tibia, 14.9 mm.; heel-to-toe, 19.8 mm.; hand, 9 mm.

Color in alcohol.—Slate blue above, brownish gray below. Upper and lower lips margined with a distinct white line, a very distinct row of small white dots extending from upper eyelid along dorsolateral fold to sacral hump. Very distinct white lines bordering outer margin of hand and ulnar fold and outer margin of foot and tarsal fold. A very distinct short horizontal white line above vent, this line just matching white line on heels when legs are flexed. A rather indistinct white line on each side extending posteriorly from angle of jaw to about middle of side. On each side posterior to this line are three rounded white dots anterior to groin. A pair of rounded white dots are in middle of throat region and a single ocellus-like white spot is in middle of pectoral region. On the forelimbs the dorsal pigment extends to base of fingers, where it stops abruptly. A narrow margin of white on lateral side of little finger to base of disk. On the hind limbs the dorsal pigment covers dorsal surface of fifth toe and half of dorsal surface of fourth toe.

Remarks.—Since the type is the only known specimen, we know nothing of this species' geographic range or variation.

Phyllomedusa hypochondrialis hypochondrialis **(Daudin)**

FIGURE 39

1803. *Hyla hypochondrialis* Daudin, p. 29 (type locality, Suriname).—Fitzinger, 1826, p. 63.—Gravenhorst, 1829, p. 29.
1820. *Calamita hypochondrialis.*—Merrem, 1820, p. 170.
1841. *Phyllomedusa bicolor.*—Duméril and Bibron, p. 629 (part).—Günther, 1858, p. 120 (part).
1862. *Phyllomedusa hypochondrialis.*—Cope, 1862b, p. 355.—Boulenger, 1882a, p. 430; 1882b, p. 264.—Berg, 1896, p. 213.—Budgett, 1899, p. 313.—Gadow, 1901, p. 204.—Méhely, 1904, p. 230.—Bles, 1905, p. 605.—Musshoff, 1906, p. 255.—Beebe, 1919, p. 208.—Nieden, 1923, p. 337.—Lutz and Lutz, 1939, p. 219.—B. Lutz, 1950, p. 601.—Funkhouser, 1957 p. 44.—Stebbins and Hendrickson, 1959, p. 527.—Gans, 1960, p. 303.—Gorham, 1963, p. 24.
1868. *Pithecopus hypochondrialis.*—Cope, 1868, p. 112.
1923. *Phrynomedusa hypochondrialis.*—Miranda-Ribeiro, 1923a, p. 3.
1926. *Bradymedusa hypochondrialis.*—Miranda-Ribeiro, 1926, p. 105.
1961. *Phyllomedusa hypochondrialis hypochondrialis.*—Rivero, 1961, p. 150.

Diagnosis.—A small, brightly colored *Phyllomedusa* with the first toe longer than the second.

P. hypochondrialis hypochondrialis can be distinguished from all Colombian *Phyllomedusa* except *blombergi* by the combination of a bright black and white pattern on the rear of the thigh together with the first toe being longer than the second. From *blombergi* it can be distinguished by the lack of a row of white dots along each dorsolateral fold from behind the eye to the region of the sacral hump.

Description.—CNHM 81771, from Villavicencio, Meta, Colombia. Vomerine teeth absent; choanae small, rounded, and well separated; tongue three-fifths as wide as mouth opening, broadly pear-shaped, its posterior border free and unnotched. Snout short, broadly triangular when viewed from above, truncate in profile, sloping but very slightly, the upper jaw extending hardly at all beyond lower; nostrils lateral, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval slightly greater than their distance from eye. Canthus rostralis well defined; loreal region nearly flat and very nearly vertical, the upper lip flaring out hardly at all below it. Eye small, not prominent, its diameter half again as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about the distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance equal to about one-fourth its own diameter. Fingers not webbed, fourth finger nearly as long as third, disk of third covers about three-fourths the tympanic area; no projecting rudiment of a pollex; a weak ulnar ridge. Toes without webs, first toe longer than second, fifth longer than third, disk of fourth covering about two-thirds the tympanic area; a distinct oval inner and a smaller rounded outer metatarsal tubercle; no true tarsal ridge; no dermal appendage on heel. Body not elongate for a *Phyllomedusa*, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches middle of eye; when limbs are laid

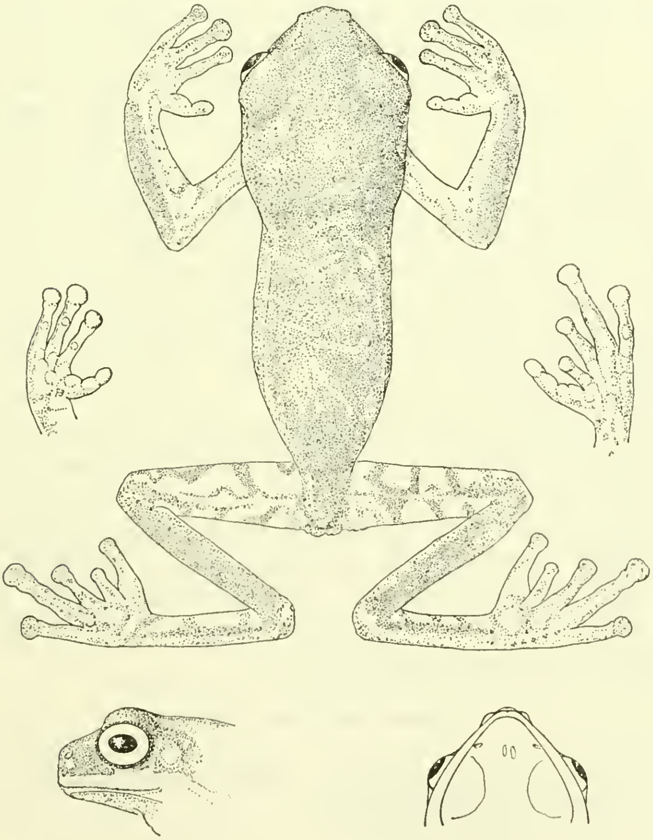

FIGURE 39.—*Phyllomedusa hypochondrialis hypochondrialis*, USNM 15249 (× 2).

along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap considerably. No patagium. Skin of upper parts rather smooth; no discernible parotoid glands. A narrow glandular fold passes downward behind the tympanum; skin of throat, chest, belly, and lower surface of thigh uniformly and very finely granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head very thick but not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 35 mm.; head length, 12.2 mm.; head width, 11.8 mm.; femur, 14.4 mm.; tibia, 16.3 mm.; heel-to-toe, 23 mm.; hand, 9 mm.

Color in alcohol.—A dark purplish-blue above, pale yellow below. Upper lip margined with white, this margin broadening below the eye to come in contact with the lower margin of the eye. The light margin of lip continues posteriorly as a light lateral stripe that passes above arm and continues along the side half-way to the groin. Below this lateral light stripe there are faint vermiculations for about half-way to groin, but posterior to this they become distinct, dark, curlicue-like, markings. The anterior and posterior surfaces of the thighs are pale with distinct, dark, more or less vertical bands, about four on each thigh. The dorsal surfaces of the thighs are faintly pigmented, this dorsal band of pigment separating the dark stripes on the anterior and posterior surfaces of the thighs. The concealed surfaces of shanks, feet, and upper arms are conspicuously marked with dark curlicues. A light stripe on the lateral margin of each hand extends along the ulnar ridge to elbow. A similar stripe on the lateral margin of each foot extends along the lateral margin of each tarsal region to and across the heel, thus giving an impression of a tarsal ridge. A short horizontal white stripe lies just above the vent.

Remarks.—It is not at all surprising to find this species in the parts of Colombia east of the Andes. Rivero (1961, p. 51) recorded it from the Venezuelan Guayana.

We have seen a cotype (USNM 5832) from Paraguay and two specimens (USNM 48857, 97090) from Pernambuco, Brazil, of what is called *P. hypochondrialis azurea* Cope from southern South America, and for the time being are willing to go along with Rivero that *azurea* is a recognizable race of *P. hypochondrialis*.

Specimens Examined

COLOMBIA

META: Acacías, MLS 245, 245a-b; Villavicencio, CJG 2318–9, CNHM 81771–4, USNM 152249–60, MLS 151.

SURINAME: Onverwacht, CJG 2422.

***Phyllomedusa nicefori* Barbour**

PLATE 42D–F

1926. *Phyllomedusa nicefori* Barbour, p. 191 (type locality, Colombia, Meta, Villavicencio).—Barbour and Loveridge, 1929, p. 319.—B. Lutz, 1950, p. 602.—Funkhouser, 1957, p. 47 (as *niceforoi*).—Gorham, 1963, p. 24.

Diagnosis.—A moderate-sized *Phyllomedusa* with the first toe longer than the second, without conspicuous, distinct, rounded white spots along the side anterior to the groin, and without distinct white caps on the upper surfaces of disks of fingers one and two.

Among the *Phyllomedusa* now known from Colombia, this species may be distinguished from all except *edentula, boliviana,* and *tarsius* by the lack of conspicuous black and white markings on the rear surface of the thigh. From *tarsius* it differs in lacking white caps on the disks of fingers one and two. From *boliviana* it differs in lacking rounded white spots anterior to the groin or, if such spots are present, they are much smaller than in *boliviana.* From *edentula* it differs in having a pair of rounded white spots below the vent.

Description.—MCZ 11611 (holotype), from Villavicencio, Meta, Colombia. Vomerine teeth in two short, oval series lying close together and between the rather large, ovate choanae; tongue one-half as wide as mouth opening, its posterior border free and truncate but not notched. Snout large, pointed when viewed from above, sloping in profile, the upper jaw extending but slightly beyond lower; nostrils lateral, not projecting, their distance from end of snout about two-thirds that from eye, separated from each other by an interval equal to about four-fifths their distance from eye. Canthus rostralis well defined; loreal region concave and oblique, the upper lip flaring out strongly below it. Eye large, very prominent, its diameter greater by one-third than its distance from nostril; interorbital distance about 1½ times the width of upper eyelid, which is relatively wide, slightly greater than distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance about equal to one-fourth its own diameter. Fingers entirely free, fourth finger considerably longer than second, just reaching to disk of third which covers about three-fourths the tympanic area; no rudiment of a pollex; toes without webs; first toe longer than second, fifth distinctly longer than third, disk of fourth covering about three-fourths the tympanic area; an oval inner but no discernible outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches posterior margin of eye;

when limbs are laid along the side, knee and elbow overlap distinctly; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts glandular but not warty. Parotiod glands present but not pronounced, extending posteriorly nearly to sacrum; skin of throat, chest, belly, and lower femur uniformly granular; a pair of yellowish warts in tandem on pectoral region of chest, a pair on base of each leg near the vent, and a series of five on ventral surface of base of arms; a short series behind the angle of each jaw and well-developed patches of them along sides of body; no trace of a skinfold across chest; vocal sac not apparent.

Dimensions.—Head and body, 76.5 mm.; head length, 25.9 mm.; head width, 25.2 mm.; femur, 33.3 mm.; tibia, 35.8 mm.; foot, 49.6 mm.; hand, 21.9 mm.

Color in alcohol.—Uniform very dark (midnight) blue above, dirty gray below. Slightly mottled on sides of body and limbs where the dorsal and ventral colors meet. The warts on chest and near the vent stand out as clear yellowish marks.

Remarks.—The series of specimens at hand, including a number of rather fresh topotypes, indicate that this species is rather constant in its characters. Two of the specimens (CNHM 81769–70) are more reddish than the others but this may be due to preservative. The pair of white spots below the vent is conspicuous in all of them. The dorsal and ventral ground colors come together along the sides anterior to the groin with a slight mottling effect but without any development of clear, rounded, white spots the size of the tympanum.

We are unable to understand why Funkhouser (1957, pp. 47, 48) was so unwilling to commit herself concerning the status of this form as there is a perfectly good type available.

Specimens Examined

COLOMBIA

Antioquia: Porcecito, CNHM 63860.
Meta: Villavicencio, MCZ 11611 (type), CNHM 81769–70, USNM 157261–2, MLS(a).
Norte de Santander, San Calixto, USNM 118171.
Santander: Aratoka, MZUM 54634.
No data: MLS 244.

Phyllomedusa boliviana **Boulenger**

Plate 40g–i

1902. *Phyllomedusa boliviana* Boulenger, p. 395 (type locality, Bolivia, Chulumani).—Nieden, 1923, p. 341.—B. Lutz, 1950, p. 602.—Funkhouser, 1957, p. 57.—Gorham, 1963, p. 23.

Diagnosis.—A moderate-sized *Phyllomedusa* with well-developed parotoid glands, the first toe longer than second, and some rather clear, rounded, white spots in the dorsal ground color along the sides between axilla and groin.

From *P. nicefori*, the Colombian species with which it is most likely to be confused, *P. boliviana* can be distinguished by the white spots along the side. In *nicefori* there may be a few white spots in this region but if so they are small and granular rather than large (the size of the tympanum) and rounded as they are in *boliviana*.

Description.—MLS 62, from La Providencia, Caquetá, Colombia. Vomerine teeth in two short series, lying close together between the small, squarish choanae; tongue three-fourths as wide as mouth opening, broad, its posterior border extensively free and unnotched. Snout short, broadly triangular when viewed from above, truncate and slightly sloping in profile, the upper jaw not extending appreciably beyond lower; nostrils lateral, not at all superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis well defined; loreal region slightly concave and nearly vertical, the upper lip flaring out but slightly below it. Eye not large nor particularly prominent; its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance equal to one-fourth its own diameter. Fingers not webbed, fourth finger considerably longer than second, nearly as long as third, disk of third just covers the tympanic area; no projecting rudiment of a pollex; a weak ulnar ridge. Toes without webs, first toe longer than second, fifth longer than third, disk of fourth covering about one-half the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a very weak tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts very finely glandular, a pair of broad, low, inconspicuous parotoid glands extending from the eye to region of the sacral hump; a rather narrow glandular ridge passes down and behind the tympanum; skin of throat and chest very finely granular, that of belly and lower surface of thigh uniformly and rather coarsely granular; no traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 62.6 mm.; head length, 21 mm.; head width, 21.8 mm.; femur, 27 mm. tibia, 32.4 mm.; heel-to-toe, 44.1 mm.; hand, 20.4 mm.

Color in alcohol.—Blue-black above, cadaverous gray below. Margin of lower lip white; a white line extending from posterior corner of lip to above arm. Distinct whitish rounded spots along the sides between axilla and groin, on anterior and posterior surfaces of thigh, on the concealed surfaces of thigh, and on the concealed surfaces of shanks and feet. Whitish blotches on the lower surface of base of each arm, with less-distinct ones on the upper arm, and a rounded distinct light spot in the middle of chest. A light line above the vent and similar horizontal light lines on each heel. The ulnar and tarsal ridges lined with white.

Remarks.—When we first received the single Colombian specimen we thought it might be *P. feltoni* so we sent it off at once for our friend Benjamin Shreve to examine. He reported that while it was close to *feltoni*, in his opinion it was closer to *boliviana*, an identification with which we concur. The two topotypes of *boliviana* in the British Museum differ from our specimen in that they have a distinct pair of white spots below the vent while the specimen from La Providencia has only one pale spot on one side below the vent. Whether this difference has any significance we cannot say at this time.

Specimens Examined

COLOMBIA

Caquetá: La Providencia, MLS 62.

BOLIVIA: Chulumani, 2,000 m., BM 1901.8.2.49–50 [1947.2.22.32–3] (cotypes); Buenavista (Department of Santa Cruz), USNM 118699–700.

Phyllomedusa tarsius **(Cope)**

Plate 41

1868. *Pithecopus tarsius* Cope, p. 113 (type locality, Peru, Upper Amazon below mouth of Río Napo).

1882. *Phyllomedusa tarsius.*—Boulenger, 1882a, p. 428.—Ruthven, 1922, p. 57.—Nieden, 1923, p. 343.—B. Lutz, 1950, p. 603.—Funkhouser, 1957, p. 51.—Gorham, 1963, p. 24.

Diagnosis.—A large *Phyllomedusa* with the first toe longer than the second, white caps on disks of first and second fingers, a white line above the vent and on base of each heel, and a pair of white spots below the vent.

This species differs from *P. bicolor* in having the first toe longer than second and in lacking brilliant markings on the legs. From *P. edentula*, to which it is perhaps most closely related, it differs in having white caps on the disks of first and second fingers, the sides and thighs marked with pale fleckings, a white line above the vent and on each heel, and paired white spots below the vent.

Description.—BM 1902.5.15.25, from Villeta, 3,500 feet, Cundinamarca, Colombia. Vomerine teeth in two short, rather rounded series lying between the moderate-sized oblong choanae; tongue two-thirds as wide as mouth opening, an elongated heart-shape, its posterior border free and shallowly notched. Snout moderate, somewhat pointed when viewed from above, sloping in profile, the upper jaw extending very slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis well defined; slightly curving; loreal region slightly concave and nearly vertical, the upper lip flaring out slightly below it. Eye moderate, not particularly prominent, its diameter one-third again as great as its distance from nostril; interorbital distance slightly greater than width of upper eyelid, which is obscured by parotoid gland. Palpebral membrane not reticulate but with some pigment. Tympanum distinct, about three-fifths the diameter of eye and nearly in contact with it. Fingers unwebbed, fourth finger considerably longer than second and practically as long as third; disk of third covers about three-fourths the tympanic area; no projecting rudiment of a pollex; no true ulnar ridge but side of hand and arm marked by a white line which gives the impression of a ridge. Toes unwebbed, first toe longer than second, fifth longer than third, reaching nearly to disk of fourth which covers about one-half the tympanic area; a distinct oval inner and a rather obscure outer metatarsal tubercle; no definitive tarsal ridge but a pale line along outer surface of foot and tarsus which gives the impression of a ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior margin of eye; when limbs are laid along the side, knee and elbow overlap appreciably; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts very finely glandular, a fairly well-developed parotoid gland extending from upper eyelid to sacrum. Skin between axilla and groin somewhat granular and wrinkled. Skin of throat very finely granular, chest fairly smooth, that of belly and lower thigh uniformly granular; traces of a skinfold across chest; no inguinal gland; female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 95.5 mm.; head length, 28.9 mm.; head width, 32.5 mm.; femur, 42.3 mm.; tibia, 45.1 mm.; foot, 63.4 mm.; hand 28.5 mm.

Color in alcohol.—Dark blue above, a dirty bluish brown below. On the side the dorsal and ventral colors are separated by some white spots superimposed on some of the granular elevations, and above these are rather numerous whitish-lavender flecks on the smoother skin above granular region. The margin of palpebral membrane is purple, and this pigmentation extends down a millimeter or two on the membrane itself. Lower eyelid white, lower lip white, a short, indistinct white line behind angle of jaw on each side, a single pectoral white spot, a white blotch at pectoral portion of base of each arm; disks of thumb and first finger white; an indistinct white line along the outer side of hand and lower arm and outer side of foot and tarsus. A white line across each heel and another above vent. A pair of white spots below vent and a couple of indistinct white spots on lower surface of each thigh. Dorsal ground color is present on upper arm and extends to disks of third and fourth fingers. It is present on thigh and extends to disks of fourth and fifth toes. Both anterior and posterior faces of thighs are flecked with whitish lavender spots like those along the sides.

Variation.—The Colombian specimen is very similar to virtual topotypes from Peru. In one of the Peruvian specimens (BM 1908.5.29.45) the flecks are not so well developed, either on the thighs or on the sides, while in a specimen from Pebas the ulnar and tarsal stripes are not so pronounced although they are well developed in the other specimen from the same locality. The largest specimen, a female from Pebas, has a head-and-body length of 110.5 millimeters.

Specimens Examined

COLOMBIA
  Cundinamarca: Villeta, 3,500 ft., BM 1902.5.15.25.
PERU: Pebas, BM 1908.5.29.45; Chanchamayo, BM 67.9.17.6–7.

Phyllomedusa edentula **Andersson**

Plate 42a–c

1945. *Phyllomedusa edentula* Andersson, p. 84 (type locality, Ecuador, Río Pastaza watershed).—Funkhouser, 1957, p. 43.—Gorham, 1963, p. 23.

Diagnosis.—A large *Phyllomedusa* with pigment on tops of the two outer fingers, with the first toe longer than second, and without two rounded white spots below the vent.

The longer first toe serves to differentiate *P. edentula* from *P. bicolor*, which it approaches in size; and the lack of the two white spots below the vent distinguishes it from *P. nicefori*, which it approaches in general habitus and pattern.

Description.—CNHM 74906, from Sautatá, Chocó, Colombia. Vomerine teeth in two small patches lying not too close together between the large, oblong, horizontally oriented choanae; tongue four-fifths as wide as mouth opening, somewhat triangular in shape, its posterior border extensively free and unnotched. Snout moderate, more pointed than rounded when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils lateral, somewhat projecting, their distance from tip of snout about equal to their distance from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis well defined; loreal region somewhat concave and nearly vertical, the upper lip flaring out but very slightly below it. Eye moderate, not particularly prominent, its diameter half again as great as its distance from nostrils; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal to distance between nostrils. Tympanum very distinct, about three-fifths the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers unwebbed, fourth finger considerably longer than second, reaching to middle of disk of third which covers about two-thirds the tympanic area; no projecting rudiment of a pollex; ulnar ridge a row of very low, white, rounded, wart-like structures. Toes unwebbed, the first toe longer than second, much longer than third, disk of fourth covering about one-half the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches anterior border of tympanum; when limbs are laid along the side, knee and elbow overlap slightly; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. A low but distinct glandular dorsolateral fold extends on each side from behind eye to region of sacral hump. Skin of throat and chest finely granular, that of belly and lower surface of thigh uniformly and more coarsely granular; no trace of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 91.5 mm.; head length, 30 mm.; head width, 31.4 mm.; femur, 37.5 mm.; tibia, 42 mm.; heel-to-toe, 60.8 mm.; hand, 29.5 mm.

Color in alcohol.—Gunmetal blue on all exposed dorsal surfaces except top of first two fingers and first three toes. A row of white dots from posterior angle of jaw to above axilla, another row along ulnar region. Small, scattered white dots along the side between the dorsal ground color and the ventral ground color, which is cadaverish gray. Anterior and posterior concealed surfaces of the thigh lavender. A distinct, ocellus-like pectoral spot but no white spots below vent. All-in-all a rather somber-looking *Phyllomedusa*.

Remarks.—We are not satisfied with the present arrangement of the species of somber-colored *Phyllomedusa* from western South America. Few of these species have been seen in life by other than the collectors, and no one person has collected many examples of the named species. Of the 17 species of phyllomedusids described from the northern half of western South America, the recent monographer of the group saw type material of only four. So far we have seen type material of eleven and are not yet ready to assign more than relatively few of the names with any degree of confidence.

The two specimens here called *edentula* have been directly compared with the type of that species and the three seem to be conspecific. It is true that the type was described as toothless, but there are two low ridges of the same size and position as the tooth ridges in the two specimens at hand. In these the female has teeth in both ridges but the male has them in the left ridge only.

It somewhat disturbs our sense of zoogeography to assign specimens that were collected practically on the Darién border of Colombia to a species described from the eastern side of Ecuador, but for the present we see no alternative.

The two specimens for which we are using the name *P. edentula* are certainly closely related to *P. nicefori* and to *P. orcesi*, if in fact the latter two are really distinct. The specimens of *edentula* differ most conspicuously from those of the latter two species in their larger size and in lacking two light spots below the vent.

The two Chocó specimen were in amplexus when taken.

Specimens Examined

COLOMBIA
Chocó: Sautatá, CNHM 74906–7.
ECUADOR: Río Pastaza watershed (type), NR collection.

***Phyllomedusa* species**

FIGURE 40

A single specimen of *Phyllomedusa* from Serranía de La Macarena in Meta, Colombia, cannot be assigned to any species we now know. This individual (CNHM 81338) is an adult female measuring 62.5 millimeters in head-body length.

This frog seems most like *P. edentula*, but she differs from that species in her much smaller size (62.5 as compared to 91.5 and 96.7 mm. for our two Colombian specimens of *edentula*), in having low but distinct triangular dermal appendages on the heels, and in the fact that along her sides the dorsal and ventral ground colors are separated by a nearly complete, distinct white line. On both sides this line is interrupted in the region of the groin to form a short row of elongated pale spots. This specimen has been directly compared with the type of *edentula* and differs from it in the same respects, although the type is slightly smaller (83.6 mm. in head-body length) than the two Colombian specimens.

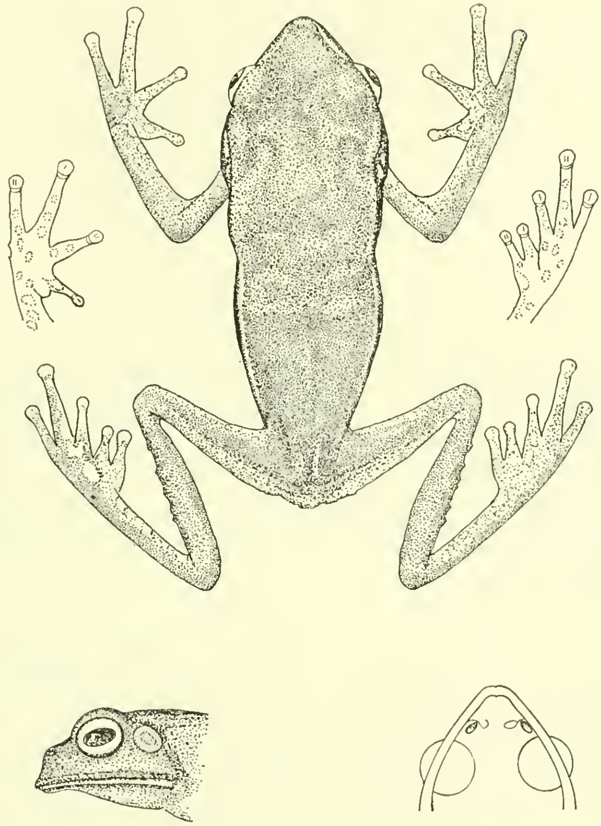

Figure 40.—*Phyllomedusa* species, CNHM 81338 (same size).

There is some evidence of endemism in Serranía de La Macarena, which is an isolated mountain range. (*Gastrotheca medemi*, described as a new species in this volume, also comes from there.) Since on the basis of the single specimen at hand we cannot tell whether this example of a *Phyllomedusa* simply represents a local race of *edentula* or whether it in fact represents a distinct species, we refrain from proposing a name for it at this time.

Specimens Examined

COLOMBIA

Meta: Serranía de La Macarena, Río Guapaya, 300 m., CNHM 81338.

Genus *Smilisca* Cope

1865. *Smilisca* Cope, p. 194 (type species, *Smilisca daulinia* Cope=*Hyla baudini* Duméril and Bibron).

Generic diagnosis.—A pair of postorbital projections on the frontoparietal bones; M. depressor mandibulae with two distinct heads, one of which originates on the squamosal; vocal sac in male subgular with a tendency toward pairing.

Key to Colombian Species of *Smilisca*

*a*¹. A distinct postocular dark stripe; tympanum two-thirds or more the diameter of eye . . . . **S. phaeota**

*a*². No postocular dark stripe; tympanum hardly more than half the diameter of eye . . . . **S. gabbi**

***Smilisca phaeota* (Cope)**

PLATE 43D–F

1862. *Hyla phaeota* Cope, 1862b, p. 358 (type locality, Colombia, Turbo).—Peters, 1873, p. 618.—Boulenger, 1882a, p. 402.—Werner, 1897, p. 215.—Günther, 1901, p. 269.—Nieden, 1923, p. 261.—Dunn, 1931, p. 413.—Liu, 1935, p. 34.—Gaige, Hartweg, and Stuart, 1937, p. 4.—Taylor, 1942, p. 80.—Taylor and Smith, 1945, p. 589.—Breder, 1946, p. 416.—Smith and Taylor, 1948, p. 88.—Taylor, 1952, p. 837.—Gorham, 1963, p. 22.—Sexton, Heatwole, and Knight, 1964, p. 271.

1923. *Hyla baudini dolomedes* Barbour, p. 11 (type locality, Panama, Río Esnape, Sambu Valley).

1960. *Smilisca phaeota.*—Starrett, 1960a, p. 300.—Goin, 1961, p. 15.

Diagnosis.—A moderate-sized *Smilisca* with a postocular dark stripe that includes the tympanum and with the tympanum at least two-thirds the diameter of eye.

S. phaeota may be distinguished from *S. gabbi*, the only other species of *Smilisca* known from Colombia, by the above two characters, for *gabbi* lacks the postocular dark stripe and has a tympanum not over one-half the diameter of eye.

Description.—CJG 2252, from Río Calima above Córdoba, Valle, Colombia. Vomerine teeth in two short, transverse series lying close together on a level with the posterior borders of the small, somewhat oval choanae; tongue two-thirds as wide as mouth opening, broadly oval, its posterior border slightly free and very shallowly notched. Snout short, rather rounded when viewed from above, rounded in profile, the upper jaw extending somewhat beyond lower; nostrils nearly lateral, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval nearly equal to their distance from eye. Canthus rostralis well defined; loreal region concave and somewhat oblique, the upper lip flaring out rather strongly below it. Eye moderate, not particularly prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about the diameter of eye, separated from eye by a distance nearly equal to one-third its own diameter. Fingers webbed at base, fourth finger considerably longer than second, reaching to middle of disk of third which covers about one-third the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching distal end of antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe covering about one-fourth to one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow meet snugly; when hind legs are bent at right angles to body, heels overlap greatly. No patagium. Skin of upper parts smooth, a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest finely granular, that of belly and lower surface of thigh uniformly and more coarsely granular; a distinct skinfold across chest; adult male, vocal sac well developed. Skin of head not coossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 55.6 mm.; head length, 19.6 mm.; head width, 20.8 mm.; femur, 25.6 mm.; tibia, 33 mm.; heel-to-toe, 40.2 mm.; hand, 16.8 mm.

Color in alcohol.—Above, light gray with mottlings on the dorsum of dark gray, top of thigh pale gray with pepper-like dark flecks, top of shank pale gray with several indistinct dark gray crossbands. Loreal region a little darker than top of head, a very distinct dark postocular stripe runs posteriorly from the hind corner of eye, includes all of tympanum, and terminates above shoulder. This dark stripe is bordered below by a very narrow, pale, light margin. Also, there is a light line along the entire edge of the upper lip. Ventrally the specimen is very pale cadaverish gray except under chin and throat where it is rather heavily flecked with fuscous.

Variation.—In *S. phaeota* the females are distinctly larger than the males. Of two large females at hand, one (CNHM 54768) measures 69.2 millimeters in head-and-body length and the other (CJG 2250) 71.3 millimeters. The three largest males at hand (CJG 2251–53) measure 54.2, 55.3, and 55.6 millimeters in head-body length.

In the fresh material at hand, the pattern is very much the same on all specimens, differing only in intensity. A rather distinct pattern of dorsal dark blotches and bands across the tops of the thighs and shanks is evident in most of the specimens. In fresh material the dorsal blotches are dark gray, on a light gray dorsal ground color. In all specimens a light-bordered, dark, postocular stripe that includes the tympanum is conspicuous. In some, the dark blotches on the back and the dark crossbands on the leg stand out prominently; in others, the dark dorsal markings are very dim or, as in some cases, absent. For example, in CJG 2252, the described specimen, the dark markings are conspicuous on the back and top of the shank but are absent from the thighs. In other specimens (such as CNHM 30805) there are no pronounced blotches on either the back or the tops of the legs. Most of the long-preserved material at hand has faded to a brownish hue; in fact, some long-preserved specimens are now simply dark brown.

Remarks.—Although the type is from Colombia, we have described here a fresh specimen since the type is old and has faded to a pale brown.

The series of specimens CJG 2249–57 was collected by Goin and Medem at night, after a torrential rain early in the evening, on July 13 at La Granja, on the Río Calima above Córdoba in the state of Valle. These specimens were collected on the ground in a palm grove. The males were calling from little puddles on the ground. In life the dorsal ground color was light brown, with dark mottlings on the back; the loreal postocular stripe was bright green. Two pairs of individuals were clasping, and that night one or both of the females released eggs in the collecting bag.

Four specimens (CJG 2310–13) were collected east of Tumaco, in Nariño, in March 1962. Apparently they had recently transformed, as their head-body lengths range from 19.1 to 23.7 millimeters.

Specimens Examined

COLOMBIA

Antioquia: Puerto Berrio, CNHM 30855; Chigorodó, USNM 151891.

Caldas: Pueblorrico-Santa Cecilia, CNHM 54768–71.

Chocó: AMNH 3984–86; Andagoya, BM 1915.10.21.69–70. CNHM 81857, USNM 152153–5; Golfo de Urabá, CNHM 63881; Peña Lisa, Condoto, BM 1913.11.12.118–125, 1913.11.12.137–146; Pizarro, CNHM 4451–3, 4455–61; Quibdó, MLS 257; Río San Juan, Playa de Oro, CNHM 54772.

Nariño: East of Tumaco, Río Rosario, CJG 2310–3.

Valle: Buenaventura, BM 1895.11.16.82; South of Buenaventura, USNM 151994; Río Raposo, UV 346–7, USNM 151883–4; Río Calima above Córdoba, CJG 2249–57; Río Calima, CJG 2463 (11).

ECUADOR: BM 1907.3.29.82. Esmeralda Province: near El Placer, JAP 2843–5, 2847–8; near Cachabi, JAP 2916–8, 2920, 2962, 2964, 2996, 3044. Imbabura Province: 1½ km. northwest of Lita Station, JAP 2798–806; near Lita Station, JAP 2814–24, 2829–30, 2935. Pichincha Province: vicinity of Santo Domingo de los Colorados, JAP 4014, 4055–6, 4058–64, 4124–5, 4330; 18 km. west of Santo Domingo de los Colorados, JAP 4048–50, 4133.

***Smilisca gabbi* (Cope)**

Plate 43a–c

1876. *Hyla gabbi* Cope, p. 103 (type locality, near Sipurio, east coast of Costa Rica).—Brocchi, 1881, p. 37.—Boulenger, 1882a, p. 372; 1898, p.

478.—Werner, 1896, p. 355; 1903, p. 351.—Günther, 1901, p. 274.—Nieden, 1923, p. 252.—Dunn, 1931, p. 413; 1932, p. 25.—Liu, 1935, p. 34.—Taylor, 1952, p. 840.—Gorham, 1963, p. 22.

1960. *Smilisca gabbi*.—Starrett, 1960a, p. 300.—Goin, 1961, p. 15.

Diagnosis.—A moderate-sized *Smilisca* without a dark postocular stripe and with a tympanum equal to only about one-half the diameter of eye.

S. gabbi may be distinguished from *S. phaeota*, the only other species of *Similisca* now known from Colombia, by the smaller tympanum (tympanum at least two-thirds diameter of eye in *phaeota*) and by the absence of the postocular dark stripe.

Description.—CNHM 63893, Villa Arteaga, Urabá, Antioquia, Colombia. Vomerine teeth in two short, transverse series, lying close together between the small, rounded choanae; tongue two-thirds as wide as mouth opening, very broadly cordiform, its posterior border very slightly free and very shallowly notched. Snout short, broadly U-shaped when viewed from above, slightly rounded in profile, the upper jaw extending a little beyond lower; nostrils more lateral than superior, moderately projecting, their distance from end of snout equal to about two-fifths their distance from eye, separated from each other by an interval equal to about four-fifths their distance from eye. Canthus rostralis well defined; loreal region concave and somewhat oblique, the upper lip flaring out somewhat below it. Eye moderate but prominent, its diameter slightly greater than its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly less than width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-third the diameter of eye, separated from eye by a distance equal to one-third its own diameter. Fingers webbed, the web reaching the middle of penultimate phalanx of third finger; fourth finger slightly longer than second, just reaching to disk of third which snugly covers the tympanic area; no projecting rudiment of a pollex; a low ulnar ridge. Toes completely webbed, the web reaching the base of disk of all toes, third and fifth subequal, disk of fourth toe practically covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; an inner but no outer tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region as wide or a little wider than greatest width of head; when hind leg is adpressed, heel reaches slightly beyond tip of snout; when limbs are laid along the side, knee and elbow just fail to meet; when hind legs are bent at right angles to body, heels overlap appreciably. No patagium. Skin of upper parts smooth; a distinct narrow glandular ridge passing above the tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly granular; weak traces of a skinfold across chest; adult gravid female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 52.2 mm.; head length, 17.4 mm.; head width, 18 mm.; femur, 27.7 mm.; tibia, 29.9 mm.; heel-to-toe, 37.2 mm.; hand, 13.5 mm.

Color in alcohol.—A light brown dorsally and cadaverish gray below. There are small, inconspicuous, scattered, dark brown spots on dorsum and top of head. The most conspicuous part of the pattern is a series of distinct light spots along each side between axilla and groin. Some of the light spots are nearly half the diameter of the tympanum. These spots are more thickly scattered in region of the groin. Similar but much smaller light spots are present on the posterior surfaces of the thighs. Very faintly discernible dark crossbands are on the dorsal surfaces of the shanks.

Remarks.—We have seen only a single unquestioned specimen of *S. gabbi* from Colombia, but we strongly suspect that when adequate collecting is done around the Gulf of Urabá this species may well be found to be common.

The two specimens from Sutatenza, in Boyacá, are included as *gabbi* only provisionally. Their slender build and small tympanum separate them from *phaeota* but a dark postocular stripe and dark, cruciform blotches on the back make them superficially resemble that species rather than *gabbi*. It is possible that they represent an undescribed race of one of these species but a final decision must be postponed until fresh material is collected.

Since we are not acquainted with the frogs in Central America, we cannot comment on Taylor's assigning of *Hyla salvini* of Boulenger to this species.

Specimens Examined

COLOMBIA
Antioquia: Villa Arteaga, Urabá, CNHM 63893.
Boyacá: Sutatenza, MLS 285, 285a.
COSTA RICA: Near Sipurio, USNM 30658–9 (cotypes).

Genus *Sphaenorhynchus* Tschudi

1838. *Sphaenorhynchus* Tschudi, p. 71 (type species, *Hyla lactea* Daudin=*Hyla aurantiaca* Daudin).

Generic diagnosis.—Moderate to small frogs, bright green or yellowish in life; snout very pointed and projecting in lateral view; male with the external vocal pouch made up of longitudinal folds, bounded anteriorly and posteriorly by transverse folds; a posteriorly projecting process on the ischium; reduced number of maxillary teeth (33 on one side being the greatest number now known in *S. aurantiacus*; prefrontals not in contact. Very aquatic.

Key to Colombian Species of *Sphaenorhynchus*

*a*¹. Vomerine teeth present and tympanum apparent externally.
  *b*¹. A distinct canthal dark stripe from tip of snout to eye . . . **S. aurantiacus**
  *b*². No dark stripe from tip of snout to eye . . . . **S. dorisae**
*a*². No vomerine teeth; tympanum not apparent externally . . . . **S. habrus**

Sphaenorhynchus habrus **(Goin)**

Figure 41

1957. *Sphenohyla habra* Goin, p. 18 (Type locality, Leticia, Amazonas, Colombia); 1958, p. 121.
1961. *Dryomelictes habra.*—Goin, 1961, p. 9.
1963. *Hyla habra.*—Gorham, 1963, p. 22.

Diagnosis.—A tiny *Sphaenorhynchus* without an apparent tympanum and without vomerine teeth.

The absence of the two above-mentioned characters serves to separate *S. habrus* at a glance from both *S. dorisae* and *S. aurantiacus*, the two other species of the genus known to occur in Colombia.

Description.—UF 8508 (holotype), from Leticia, Amazonas, Colombia. Head moderately broad, width about equal to distance from snout to occiput; snout an obtuse triangle as seen from above, tapering abruptly to a slightly rounded tip; snout pointed and pronouncedly projecting as seen from the side; the eyes very dark and thus standing out prominently against, and through, the milky white skin, but the

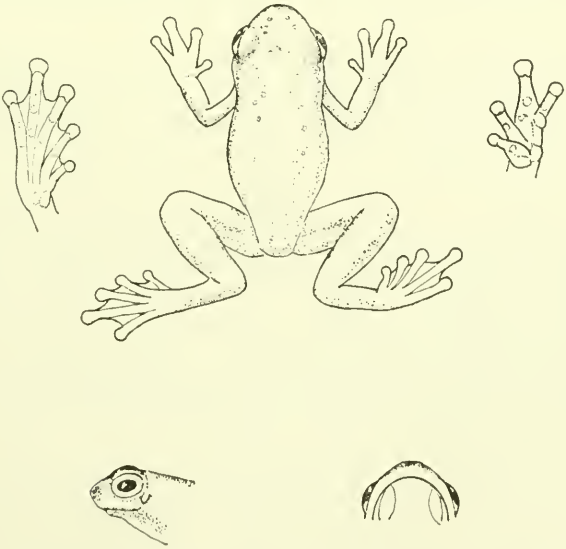

Figure 41.—*Sphaenorhynchus habrus*, holotype, UF 8508 (× 2, except foot and hand, which are × 3).

eyes neither particularly large nor protuberant; diameter of eye equal to distance from eye to tip of snout; nostrils very near tip of snout; interorbital space equal to about 1¼ times the diameter of eye; no external tympanum discernible; upper eyelids, top of head, and dorsum smooth. The urostyle, vertebrae, and frontoparietal bones bright green and show clearly through the pale whitish skin of back; the green limb bones of hind legs plainly seen from ventral surface. No green discernible through skin on front limbs or pectoral girdle. Well-developed disks on all fingers and toes. Fingers, except first, not particularly slender; with but the merest rudiment of a web; first finger pronouncedly shorter and more slender than second; fingers 3–4–2–1 in order of decreasing length. A pronounced rudiment of a pollex. Toes moderately slender, all fully webbed except fourth, which is webbed to penultimate phalanx and has a margin of web to disk; toes 4–3–5–2–1 in order of decreasing length, toes 3 and 5 being nearly subequal. Heels slightly overlapping when legs are flexed with femora held at right angles to the body; knee and elbow slightly overlapping when limbs pressed along the side; heel extending to middle of eye when leg is pressed along body. No patagium present. Chin, vocal pouch, venter, and underside of thighs rugose. External vocal pouch a longitudinally folded structure that extends from a horizontal fold at level of angles of jaws posteriorly to another horizontal fold at level of axillary region. No well-developed dermal anal flaps. Tongue broadly cordate, slightly free and slightly notched behind, its width about four-fifths the width of mouth. No vomerine teeth. Internal nares moderate in size and well separated.

Dimensions.—Head-body length, 15.8 mm.; head width, 5.5 mm.; tip of snout to posterior margin of eye, 4.2 mm.; diameter of eye, 2.3 mm.; hind leg (vent to tip of longest toe), 24.1 mm.; hind leg (vent to heel), 13.2 mm.

Color in alcohol.—Ground color creamy white. Small clusters of pigment cells make a number of reddish spots on top of head, dorsum, and dorsal surfaces of shanks. A reddish brown stripe from tip of snout through nostril to eye. In this specimen, after nine months in preservative, there is but the faintest suggestion of a continuation of this stripe through the eye and posteriorly in the form of a dorsolateral stripe. As mentioned above, the green bones of the axial skeleton show through the skin of the back.

Variation.—In all four of the paratypes in the collections of the University of Florida the bright green frontoparietal bones of the skull and the green vertebrae show clearly through the milky white skin. All of these paratypes (three males, one female) have the dark, rusty red spots on the back, although there is variation in conspicuousness. In one male, particularly, the spots either are not fully developed or have faded since preservation so that only a few are noticeable on the anterior portion of the dorsum; in another specimen they are moderately developed; and one male and the female have conspicuous, although small, rusty red spots over the entire top of the head and dorsum and on the dorsal surface of the shank. In the female the rusty-colored dorsolateral stripe can still be made out extending from behind eye to about the region of the sacral hump. The dark loreal stripe from tip of snout to eye is present in all four specimens.

Structurally these specimens are rather uniform. None of them has apparent external tympani or discernible vomerine teeth. In all of them the toes are extensively webbed while the fingers are but very slightly webbed. The first finger on these specimens, as in the type, is much smaller in diameter than the other fingers. These specimens, as well as the type, have a rudimentary pollex. The three males have external vocal pouches similar to that of the type.

There seems to be a sexual difference in size. The female has a head-and-body length of 19.1 millimeter while the three males are 15.1, 15.7, and 16.4 mm. in head-and-body length.

Coloration in life.—In life these frogs were bright green above with a pair of rusty red dorsolateral stripes and small rusty red spots on the dorsum between the dorsolateral stripes and on upper surfaces of the legs. The upper eyelids were reddish. The vocal pouch of the male was bright green. The underside of the hind legs was greenish, with the rest of the venter pale greenish white.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, UF 8508 (type), 8509 (four paratypes), USNM 138859.

Sphaenorhynchus aurantiacus **(Daudin)**

PLATE 44A–C

1802. *Hyla aurantiaca* Daudin, p. 28 (type locality, Brazil); 1803, p. 57.—Duméril and Bibron, 1841, p. 610.—Burmeister, 1856, p. 105.—Günther, 1858, p. 106.—Peters, 1871, p. 404; 1872, p. 683.—Boulenger, 1882a, p. 388.—Beebe, 1919, p. 208.—Nieden, 1923, p. 308.—Ahl, 1929, p. 147.—Crawford, 1931, p. 35.—Lutz and Lutz, 1938, p. 177.—Guibé, 1949, p. 18.—Lutz and Kloss, 1952, p. 657.—Cochran, 1953, p. 111.—Gorham, 1963, p. 21.
1802. *Hyla lactea* Daudin, p. 30 (type locality, America); 1803, p. 62.—Guibé, 1949, p. 21.
1820. *Calamita aurantiacus.*—Merrem, 1820, p. 172.
1820. *Calamita lacteus.*—Merrem, 1820, p. 172.
1838. *Sphaenorhynchus lacteus.*—Tschudi, 1838, p. 71.
1843. *Dendrosophus lacteus.*—Fitzinger, 1843, p. 31.
1865. *Dryomelictes aurantiacus.*—Cope, 1865a, p. 194.
1870. *Scytopis aurantiacus.*—Cope, 1870, p. 554; 1874b, p. 123.

1957. *Sphaenophyla aurantiaca.*—Goin, 1957, p. 21; 1958, p. 121.—Goin and Layne, 1958, p. 111.

1961. *Dryomelictes lactea.*—Goin, 1961, p. 8.

1961. *Sphaenorhynchus aurantiaca.*—Myers and Leviton, p. 61.

Diagnosis.—A *Sphaenorhynchus* with a conspicuous dark stripe along the canthus from nostril to eye, vomerine teeth, and the tympanum apparent.

S. aurantiacus may be distinguished from *S. dorisae* by the presence of the canthal stripe and from *S. habrus* by the presence of vomerine teeth and having the tympanum apparent.

Description.—MLS 17, from Puerto Nariño, Amazonas, Colombia. Vomerine teeth in two transverse series lying close together on a level with the posterior borders of the small, rounded choanae; tongue three-fourths as wide as mouth opening, ovate, longer than wide, its posterior border free and unnotched. Snout short, pointed when viewed from above, pointed in profile, the upper jaw extending very considerably beyond lower; nostrils lateral, not projecting, their distance from end of snout about two-fifths their distance from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis sharply defined; loreal region flat and vertical, the upper lip flaring not at all below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about twice the width of upper eyelid, which is slightly less than distance between nostrils. Tympanum distinct, about one-third the diameter of eye, separated from eye by a distance equal to about one-half its own diameter. Fingers webbed, web reaching base of penultimate phalanx of third finger, fourth considerably longer than second, reaching to proximal one-third of disk of third which slightly more than covers the tympanic area; first finger definitely narrower than others and partially opposable; no projecting rudiment of a pollex; a low ulnar ridge. Toes extensively webbed, the web on fourth toe reaching distal third of penultimate phalanx, third and fifth toes subequal, disk of fourth toe practically covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; a low tarsal ridge; no dermal appendage on heel. A well-developed flap of skin on each side of vent. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed heel reaches posterior margin of eye; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right, angles to body, heels overlap greatly. A patagium extends from back of upper arm to side of body. Thighs very heavy for a hylid; body in a humped, cramped position, which is characteristic of frogs of this genus when preserved. Skin of upper parts smooth. No distinct glandular ridge encircling upper part of tympanum; skin of throat and chest very finely granular; that of belly and lower surface of thigh uniformly and a little more coarsely granular; a distinct skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 38 mm.; head length, 10.8 mm.; head width, 12.5 mm.; femur, 19.9 mm.; tibia, 21.9 mm.; heel-to-toe, 16.8 mm.; hand, 11.7 mm.

Color in alcohol.—Uniform yellowish white above and below except for a narrow chocolate stripe along each canthus from tip of snout to eye.

Remarks.—We have examined and compared the types of *Hyla aurantiaca* and *Hyla lactea* (in Museum d'Histoire Naturelle, Paris) and there seems no doubt that they are conspecific, and no doubt that they are the same species as occurs in Colombia. When the two types were compared with fresh material from Leticia the only differences we could note were those due to states of preservation.

What little is known of the life history of this species was summarized by Goin (1957, p. 27).

Myers and Leviton (1961, p. 61) pointed out that the correct generic name for this group is *Sphaenorhynchus* Tschudi.

In life these frogs are pale green with the ulnar ridge, tarsal ridge, and anal flaps white, with light yellowish dorsolateral stripes from eye to groin and with the canthal stripes a rusty red.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, UF 8510 (4), CJG 2308 (5); Puerto Nariño, MLS 17, 256.

BRAZIL: MHNP 4871 (type, *aurantiacus*).

AMERICA: MHNP 4870 (type, *lacteus*).

***Sphaenorhynchus dorisae* (Goin)**

FIGURE 42

1957. *Sphenohyla dorisae* Goin. p. 16 (type locality, Colombia, Amazonas, Leticia).
1961. *Dryomelictes dorisae.*—Goin, 1961, p. 9.
1963. *Hyla dorisae.*—Gorham, 1963, p. 22.

Diagnosis.—A large *Sphaenorhynchus* with tympanum somewhat indistinct, vomerine teeth, and dermal flaps lateral to vent, and without a dark stripe along the canthus from tip of snout to eye.

S. dorisae can be distingushed from *S. aurantiacus* by the absence of the canthal stripe and from *S. habrus* by the presence of vomerine teeth.

Description.—UF 8506 (holotype), from Leticia, Amazonas, Colombia. Head moderately broad, its width about equal to distance from snout to occiput; snout triangular as seen from above, tapering to a slightly rounded tip; snout pointed and pronouncedly projecting as seen from side; eyes very dark, and thus standing out prominently against and through the milky white skin, but neither large nor protuberant; diameter of eye about equal to distance from eye to nostril; nostril very near tip of snout; interorbital space about 1½ times the diameter of eye; tympanum small and indistinct; distance from tympanum to eye about two-thirds the diameter of tympanum; eyelids, top of head, and dorsum finely rugose. Well-developed disks on all fingers and toes; disk of second finger about equal to diameter of tympanum. Fingers not particularly slender; third finger webbed to base of penultimate phalanx; fingers 3–4–2–1 in order of decreasing length. A pronounced rudiment of a pollex. Toes moderately slender, fully webbed to base of disk on each toe; toes 4–3–5–2–1 in order of decreasing length. Heels slightly overlapping when legs are flexed with femora held at right angles to body; knee and elbow strongly overlapping when limbs are pressed along side; heel extending to anterior margin of eye when leg is pressed along body. A low patagium present. Chin, vocal pouch, venter, and underside of

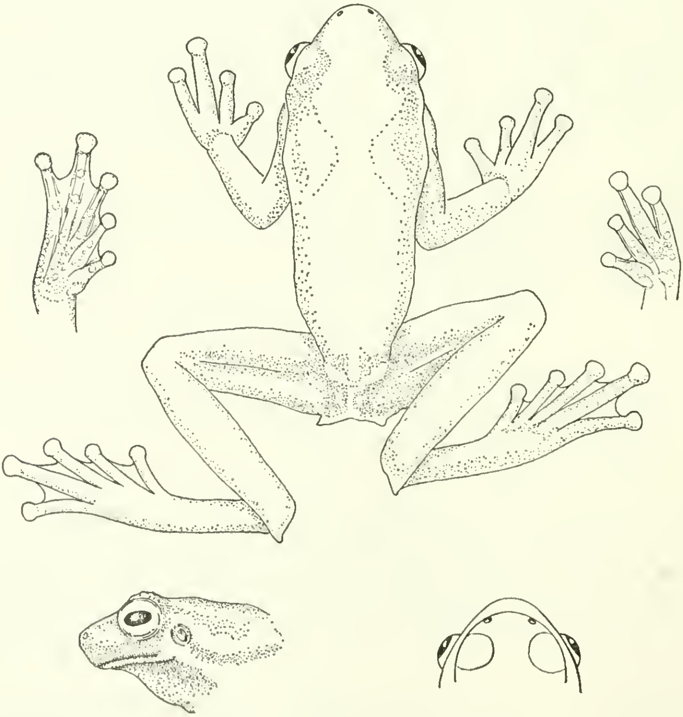

Figure 42.—*Sphaenorhynchus dorisae*, holotype, UF 8506 (× 2).

thigh rugose. External vocal pouch a longitudinally folded structure that extends from a horizontal fold at level of angles of the jaws posteriorly to another horizontal fold at level of the axillary region. A well-developed horizontal dermal flap on each side of anus, each flap about 2½ millimeters in length and 1 millimeter in height; a well-developed horizontal dermal fold on each heel. Tongue broadly cordate, slightly free and slightly notched behind, its width about four-fifths the width of mouth. Vomerine teeth in two minute, rounded patches behind a line between the internal nares and separated from them by about four diameters of an individual tooth patch; each patch of teeth smaller than an internal naris; the tooth patches separated on the midline by less than their own diameter.

Dimensions.—Head and body, 27.5 mm.; head width, 9.1 mm.; tip of snout to posterior margin of tympanum, 7.2 mm.; diameter of eye, 2.9 mm.; diameter of tympanum, 1 mm.; hind leg (vent to tip of longest toe), 40 mm.; hind leg (vent to heel), 27 mm.

Color in alcohol.—To the naked eye the type gives the impression of being uniformly creamy white. Under low-power magnification the back and the dorsal surfaces of the limbs can be seen to be finely sprinkled with red pigment.

Variation.—When fresh the two females had more spotting on the back than the three males. Both females had tiny, isolated, rusty red spots scattered over the dorsum and the dorsal surface of the shanks (after nine months in preservative). No such spots were discernible in the males at that time, although in one male reddish pigment cells could be seen in the skin of the dorsum under low magnification (× 6.6). Other than the pattern mentioned above, the skins of the specimens are uniformly creamy white. As in other preserved specimens of *Sphaenorhynchus*, the eye, with its black choroid coat, stands out against the white skin.

In no specimens of this species could be seen any green in the bones, such as observed in some of the other species in the genus.

All the specimens are uniform in having the fingers only about one-third webbed and in having the toes fully webbed to the base of the disks, except the fourth toe which has a margin of web extending to the base of the disk. In all specimens the first finger is smaller in diameter than the other fingers and seems to be twisted around so that it approaches the condition of being opposable. This same condition obtains in the other species of *Sphaenorhynchus*, and field observations on how these frogs use the hands are much to be desired. All of the paratypes have a rudimentary pollex. The specimens are consistent also in having the vomerine teeth in two tiny oval patches that are separated from the choanae by about four or five diameters of an individual patch.

There is a marked sexual dimorphism in size. The head-and-body lengths of the males are 26.9, 27.8, and 28.7 millimeters; the two females measure 36.4 and 37.2 millimeters.

Although there was no call identified with this species there can be no doubt about the maturity of the specimens, as the two females are packed with pigmented eggs.

Specimens Examined

COLOMBIA

AMAZONAS: Leticia, UF 8506 (type), 8507 (5).

Genus *Tetraprion* Stejneger and Test

1891. *Tetraprion* Stejneger and Test, p. 167 (type species. *Tetraprion jordani* Stejneger and Test).

Generic diagnosis.—Derm of head co-ossified with skull and skull strongly exostosed; teeth on vomers, palatines, and parasphenoid; no teeth on mandible.

Tetraprion jordani Stejneger and Test

PLATE 44D–F

1891. *Tetraprion jordani* Stejneger and Test, p. 167 (type locality, Guayaquil Ecuador).—Myers, 1942, p. 152.—Cochran, 1961, p. 80.—Goin, 1961 p. 15.—Gorham, 1963, p. 24.

Diagnosis.—A hylid without mandibular teeth or odontoids, but with vomerine, palatine, and parasphenoid teeth, and without a well-developed proboscis.

The character of the teeth will at once distinguish this species from all other South American frogs.

Description.—USNM 152754, from Imbilí, Río Mira, Nariño, Colombia. Vomerine teeth in two short, heavy, transverse series, lying close together on a level with the posterior borders of the moderate-sized, rounded choanae; two longitudinal rows of teeth on the posterior portion of the parasphenoid, teeth discernible beneath the oral epithelium on the lateral portions of the palatines; tongue three-fourths as wide as mouth opening, broader than long, its posterior border very slightly free and with just a hint of a notch. Snout rounded when viewed from above, rather pointed in profile, the upper jaw extending considerably beyond lower; nostrils more superior than lateral, not projecting, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis a sharply defined bony ridge, loreal region very concave and oblique, the upper lip flaring out strongly below it. Eye moderate, its diameter equal to two-thirds its distance from nostril; palpebral membrane not reticulate;

interorbital distance 2½ times the width of upper eyelid, which is about equal to the distance between nostrils. Tympanum very distinct, about one-half the diameter of eye, separated from eye by a distance nearly equal to two-thirds its own diameter. Fingers with just a trace of web at base, fourth finger considerably longer than second and reaching to middle of disk of third which just snugly covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web on fourth toe reaching just to base of the penultimate phalanx, third slightly longer than fifth, a disk of fourth covering about one-third the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body rather elongate, in postaxillary region about equal to greatest width of head; when hind leg is adpressed, heel reaches posterior margin of eye; when limbs are laid along the side, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap slightly. A trace of a patagium extends from back of upper arm to side of body. Skin of upper parts smooth, skin of throat and chest rather smooth, that of belly and lower surface of thigh uniformly granular; traces of a skinfold across chest; adult female, no vocal sac. Entire surface of top of head and face except eyelid fused into a solid, pronounced, exostosed bony casque with the only free soft derm being that of the eyelids.

Dimensions.—Head and body, 75.4 mm.; head length, 25.3 mm.; head width, 25.2 mm.; femur, 32.5 mm.; tibia, 35.4 mm.; heel-to-toe, 47.8 mm.; hand, 20.8 mm.

Color in alcohol.—Dark gray above, dirty white below. There is a smattering of small, dark blotches on the back above the shoulder region and faint reticulations of dark behind the angle of the jaw and above the insertions of the arms. No really discernible pattern is evident on the specimen and one has an impression of a dark gray frog.

Remarks.—We are greatly indebted to our good friend Dr. Gerardo Reichel-Dolmatoff for the only known specimen of this rare form ever to be taken in Colombia.

Specimens Examined

COLOMBIA

Nariño: Imbilí, Río Mira, USNM 152754.

ECUADOR: Guayaquil, USNM 12274 (type); Puná Island, SUNHM 6407; Esmeraldas Province, 30 km. north-northwest of Santo Domingo de los Colorados, JAP 1898.

PERU: Near Sullana, EK 6168.

Family Leptodactylidae

Omosternum and, usually, a free urostyle present. An arciferal girdle except in the Rhinodermatinae. No Bidder's organ. Maxillary teeth present or absent.

Subfamily LEPTODACTYLINAE

Sternum narrow, sometimes divided at the posterior end. Sacral diapophyses usually cylindrical.

Key to Colombian Genera of Leptodactylidae

- *a*^{1}. Sternum without a bony style.
  - *b*^{1}. Vomerine teeth absent.
    - *c*^{1}. Tympanum present . . . . **Trachyphrynus**
    - *c*^{2}. Tympanum absent. . . . . **Pseudopaludicola**
  - *b*^{2}. Vomerine teeth present.
    - *c*^{1}. Terminal phalanges not definitely T-shaped.
      - *d*^{1}. Tympanum absent or concealed.
        - *e*^{1}. Toes more or less webbed . . . . **Ceratophrys**
        - *e*^{2}. Toes free of webs . . . . **Niceforonia**
      - *d*^{2}. Tympanum present. . . . . **Amblyphrynus**
    - *c*^{2}. Terminal phalanges T-shaped . . . . **Eleutherodactylus**
- *a*^{2}. Sternum with a bony style.
  - *b*^{1}. Terminal phalanges not T-shaped.
    - *c*^{1}. At least some web between toes.
      - *d*^{1}. Vomerine teeth well developed . . . . **Hydrolaetare**
      - *d*^{2}. Vomerine teeth weak or absent. . . . . **Pleurodema**
    - *c*^{2}. Toes free of webs.
      - *d*^{1}. Tympanum present.
        - *e*^{1}. Vomerine teeth weakly developed or absent.
          - *f*^{1}. Edge of upper eyelid with spiny dermal processes . . **Edalorhina**
          - *f*^{2}. Edge of upper eyelid without spiny dermal processes **Physalaemus**
        - *e*^{2}. Vomerine teeth well developed . . . . **Leptodactylus**
      - *d*^{2}. Tympanum absent or concealed . . . . **Eupemphix**
  - *b*^{2}. Terminal phalanges T-shaped . . . . : . . . . **Lithodytes**

Genus *Amblyphrynus* Cochran and Goin

1961. *Amblyphrynus* Cochran and Goin, p. 543 (type species, *Amblyphrynus ingeri* Cochran and Goin).

Diagnosis.—A leptodactylid with cartilaginous sternum; terminal phalanges pointed, not T-shaped; digits not expanded; distinct tympanum; horizontal pupil; no paired odontoids on mandibular symphysis; tongue free behind; toes unwebbed; cranial derm free from head; skull strongly exostosed; vomerine teeth well behind choanae.

Amblyphrynus ingeri Cochran and Goin

FIGURE 43

1961. *Amblyphrynus ingeri* Cochran and Goin, p. 543 (type locality, 8 km. south of Gachalá, San Isidro, Cundinamarca, Colombia).

Description.—CNHM 81915 (holotype), an adult female from 8 kilometers south of Gachalá, San Isidro, Cundinamarca, Colombia, at 2,350 meters. Vomerine teeth in two short, slightly oblique series, lying close together well behind the posterior borders of the small, rounded choanae; maxillary and premaxillary teeth present; tuberculum prelinguale present but not particularly prominent and not odontoid-like; tongue two-thirds as wide as mouth opening, rounded, its sides and posterior border free. Head broad and flattened. Snout prominent, rounded when viewed from above, sloping in profile, the upper jaw extending but little beyond the lower; nostrils dorsolateral, slightly projecting, their distance from end of snout about equal to that from eye, separated from each other by an interval about equal to their distance from eye. Canthus rostralis low and poorly defined; loreal region slightly concave and very oblique, the upper lip flaring out strongly below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; pupil horizontal; interorbital distance half again as great as upper eyelid, which is slightly less than the distance between the nostrils. Tympanum very distinct, oblong, its greatest diameter perpendicular and about three-fifths the diameter of eye, separated from eye by a distance greater than

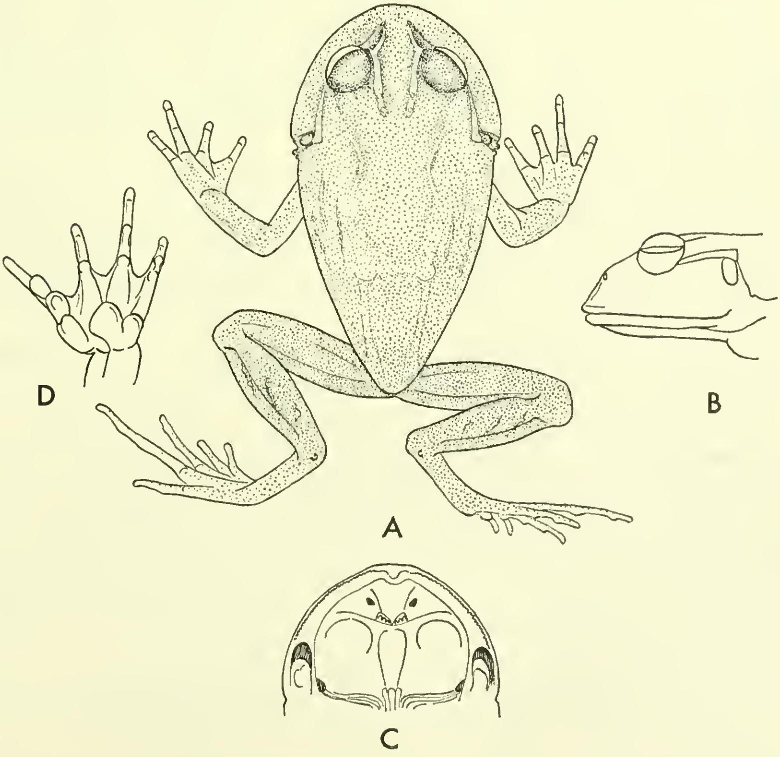

FIGURE 43.—*Amblyphrynus ingeri*, holotype, CNHM 81915 (same size, except hand, which is × 1.5).

its own greatest diameter. Tympanum lying just below distal end of a postorbital bony ridge. Fingers slightly webbed at base, fourth finger slightly shorter than second, just reaching to base of penultimate phalanx of third; a slightly projecting rudiment of a pollex; no ulnar ridge (broken right radio-ulna shows in X-ray); toes free of web, third toe a phalanx longer than fifth; a distinct oval inner and a smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body short, in postaxillary region much narrower than the greatest width of head; when hind leg is adpressed, heel reaches to eye; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels fail to meet by several millimeters. No patagium or axillary folds from the back of upper arm to side of body. Skin of upper parts dry and slightly granular. Top of head with parallel longitudinal bony ridges; a prominent bony postorbital ridge on each side. Skin along the side below sacral hump somewhat wrinkled. A rather narrow glandular ridge passing down from the tip of the postorbital ridge and behind tympanum; skin of throat and chest smooth but with scattered tiny wart-like tubercles; that of belly and lower surface of thigh uniformly and rather coarsely granular; no traces of a skinfold across chest; no inguinal gland; adult female, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull heavily exostosed.

Dimensions.—Head and body, 51.5 mm.; head length, 21.4 mm.; head width, 28.4 mm.; femur, 22.7 mm.; tibia, 21.3 mm.; heel-to-toe, 34 mm.; hand, 18.2 mm.

Color in alcohol.—Uniform pale brown, slightly darker along the side between axilla and groin.

Remarks.—In their presentation on the genus *Amblyphrynus*, Cochran and Goin (1961, pp. 545–546) remarked as follows:

> We are not at all sure of the exact relationships of *Amblyphrynus*. The very broad head gives it an aspect similar to *Ceratophrys* or *Lepidobatrachus* but we are not at all convinced that the broad-headed leptodactylids form a natural group. At any rate, *Amblyphrynus* differs from *Ceratophrys* in lacking toe webs and supraciliary processes, in having the cranial derm free of the head, and in having the vomerine teeth well behind the choanae. From *Lepidobatrachus* it differs in having the toes free of webs, in lacking paired odontoids at the mandibular symphysis, in having the tongue free behind, and in having the cranial derm free of the head.
>
> If, on the other hand, toe webbing is indicative of relationship in the leptodactylids, then on the basis of free toes and having the terminal phalanx of the digits pointed and stylus-like rather than T-shaped, *Amblyphrynus* belongs with the group that includes *Eusophus*, *Zachaenus*, and perhaps *Craspedoglossa*, although *Craspedoglossa* is somewhat intermediate and has the tip of the terminal phalanx with a round knob rather than being either truly pointed or T-shaped. From *Eusophus*, *Amblyphrynus* differs in having the vomerine teeth well behind

the choanae, in its very broad head, and in having the roof of the cranium heavily exostosed. From *Craspedoglossa* it differs in its much broader head, in having the top of the skull heavily exostosed, in having a distinct tympanum, in having the tongue more extensively free behind and in the form of the terminal phalanges. From *Zachaenus* it differs in having the roof of the cranium heavily exostosed, in having the head much broader and flatter, and in lacking axillary wings (patagium).

Finally, its lack of toe webs and the presence of a distinct tympanum readily distinguish it from both *Odontophrynus* and *Cycloramphus*, which are relatively narrow-headed forms with pointed terminal phalanges.

Perhaps all in all it has more characters that seem to be fundamental in common with *Zachaenus* than with any of the other genera. Whether or not *Zachaenus* is in fact its closest relative must await a more detailed study of the genera of leptodactylids than has yet been made.

Since this genus and species were first described, a second specimen (CNHM 54591, from Caldas, between Pueblo Rico and Santa Cecilia) has been located. Morphologically, this specimen differs from the type in being larger (78.1 mm. in head-and-body length as compared to 51.5 mm. for the type), in having the roof of the skull a little more heavily exostosed, and in having the tips of the toes expanded into narrow disks. In coloration it is darker dorsally, and the throat, chest, and undersurfaces of the thighs are more heavily mottled than in the type.

This record from the eastern slopes of the Andes indicates that *Amblyphrynus* probably is rather widely distributed through the northern Andes.

Specimens Examined

COLOMBIA

Caldas: Pueblo Rico, Santa Cecilia, CNHM 54591.

Cundinamarca: Eight km. south of Gachalá, San Isidro, 2,350 m., CNHM 81915 (holotype).

Genus *Borborocoetes* Bell

1843. *Borborocoetes* Bell, p. 34 (type species, *Cystignathus grayii* Günther).

Generic diagnosis.—Pupil horizontal. Tongue subcircular, entire or slightly nicked behind. Vomerine teeth present. Fingers free; toes free or nearly so. Terminal phalanges slightly expanded at tips. Omosternum and sternum cartilaginous. Ethmoid arch completely ossified above or nearly so.

Borborocoetes columbianus Werner

1899. *Borborocoetes columbianus* Werner, p. 480 (type locality, Monte Redondo, in Buenavista, [Meta,] Colombia, 1,000–1,300 m.—Nieden, 1923, p. 393.

No frogs identifiable as this species have come to hand, and the type has not been examined. The small size of the type (stated as being 18 mm. in length) indicates that it may be an immature frog, but its true status must remain in doubt until more collections have been made at the type locality.

The characteristics of *Borborocoetes columbianus* are given by Werner and by Nieden. The species is said to be near *B. quizensis* Jimínez de la Espada, from which it differs in the following points: Tympanum present, more or less distinct, two-thirds the diameter of eye; vomerine teeth behind the choanae; first finger as long as second; heel reaching to anterior margin of eye; nostrils much closer to tip of snout than they are to eye; subarticular tubercles distinct but small; inner metatarsal tubercle very small, no outer one; skin smooth.

Above blackish brown; a light band between the eyes; posterior thigh with fine dark dots; belly white with brown vermiculations; thigh below reddish brown.

Genus *Ceratophrys* Wied

1824. *Ceratophrys* Wied, 1824b, column 672 (type species, *C. varius* Wied).

Generic diagnosis.—Pupil horizontal. Tongue heart-shaped, free behind. Vomerine teeth present. Tympanum usually distinct, sometimes hidden. Fingers free; toes somewhat webbed, the tips not dilated. Outer metatarsals united. Omosternum cartilaginous; sternum a cartilaginous plate which ossifies in the fully adult state. Terminal phalanges simple. Upper eyelid often produced into a somewhat distinct horn or series of warts.

The two species that occur in Colombia can be quite readily distinguished from each other by their differences in leg length and other characters.

Key to Colombian Species of *Ceratophrys*

*a*¹. When hind leg is adpressed, metatarsal tubercles reach to between tympanum and eye, and heel reaches barely to axilla; size to 86 mm . . **C. calcarata**

*a*². When hind leg is adpressed, metatarsal tubercles reach beyond eye, and heel reaches at least to angle of mouth; size to 106 mm . . . . . . **C. cornuta**

Ceratophrys calcarata Boulenger

PLATE 45D–F

1890. *Ceratophrys calcarata* Boulenger, p. 327, pl. 26 (type locality, Colombia).—Boettger, 1892, p. 29.—Ruthven, 1922, p. 53.—Nieden, 1923, p. 384.—A. Lutz, 1927, p. 40.—Dunn, 1944c, p. 509.—Ginés, 1959, p. 110, fig.—Cochran, 1961a, photograph p. 89.—Rivero, 1961, p. 83.—Gorham, 1963, p. 16.

Description.—USNM 117510, a young female from Río Guaimaral, Atlántico, Colombia. A thick crest along canthus, along inner border of eye, and above tympanum; vomerine teeth in two short ridges, bordering the choanae anteriorly; tongue half as wide as mouth opening, broadly cordiform, its posterior border free and deeply notched; snout blunt, broadly rounded when viewed from above, slanting forward to upper lip in profile, upper jaw scarcely extending beyond lower. Nostrils dorsal, hardly projecting, their distance from end of snout twice their distance from eye. Canthus rostralis very indistinct; loreal region flat, sloping towards upper lip. Eye large, prominent, its diameter one-half its distance from tip of snout; interorbital diameter slightly less than that of upper eyelid, equal to interval between the nostrils; eyelid with a long single median spine, its length equal to one-fourth the width of eyelid. Tympanum fairly distinct, its greatest diameter three-fifths the diameter of eye, spearated from eye by an interval slightly greater than its own diameter. Fingers rather sort, with lateral ridges and bulbous tips free, first finger longer than second, fourth equal to first and both reaching to base of penultimate phalanx of third; a broad, flattened thumb pad present; a wide palmar callus; metacarpal tubercles well developed. Toes short, webbed at base, third toe longer than fifth and reaching to base of antepenultimate phalanx of fourth; a large, shovel-shaped inner metatarsal tubercle and a very small round outer one; a heavy tarsal ridge ending near heel; a series of weak skinfolds on heel and knee. Body very stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches barely to axilla, and metatarsal tubercles to tympanum; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are widely separated. Skin of upper parts granular, with many coarse tubercles and ridges following the color pattern; throat and chest with scattered granules; belly and lower femur with heavier granules; a bony ridge from nostril to upper lip, and two from eye going diagonally towards lip; a skinfold across chest; a ventral disk; probably lateral external vocal sacs in the male.

Dimensions.—Head and body, 71.5 mm.; head length, 32 mm.; head width, 41.5 mm.; femur 25 mm.; tibia, 23.5 mm.; foot, 28.5 mm.; hand, 19.5 mm.

Color in alcohol.—Dorsum raw sienna, with three large oval clove brown spots on either side of midline, and other more irregular spots extending onto the sides, these set with many conical or elongate tubercles; top of head mostly sepia, this color covering occiput and extending in a broad, light-edged middorsal stripe almost to sacrum; eyelids with two dark brown bars separated by the pale sienna ground color, a small oval sienna patch on top of snout, with a brown elongate gland in its center; upper leg surfaces with two wide sepia crossbars; similar but smaller bars on forearm; venter immaculate pinkish buff; anterior femur immaculate buff; posterior femur buff with a wide indistinct sepia stripe narrowing and fading out under knee; side of head dull buff-pink with four irregular diagonal sepia spots, the first from nostril to lip, the next two under eye, and the last below tympanum. Palms and soles buff-pink, suffused with pale sepia proximally; the cutting edge of inner metatarsal tubercle black.

Remarks.—The largest example at hand (USNM 146952, a female from Astillero, Norte de Santander), measures 85.5 millimeters in head-and-body length. In appearance this species rather suggests *Ceratophrys ornata* from Argentina and southern Brazil.

Specimens Examined

COLOMBIA

Atlántico: Barranquilla, USNM 145655. Río Guaimaral, USNM 177510.
Guajira: One-half mile south of Pájaro, USNM 151303–5.
Magdalena: Curumaní, USNM 118173.
Norte de Santander: Astillero, USNM 146952–3.

***Ceratophrys cornuta* (Linnaeus)**

Plate 45a–c

1758. *Rana cornuta* Linnaeus, p. 212 (type locality, Virginia [in error]).—Schneider, 1799, p. 125.—Shaw, 1802, p. 162, pls. 48, 49.—Merrem, 1820, p. 176.—Andersson, 1900, p. 20.
1768. *Bufo cornutus.*—Laurenti, 1768, p. 25.—Shaw, 1802, p. 162, pls. 48, 49.—Daudin, 1802, p. 102, pl. 38; 1803, p. 214.—Latreille, 1825, p. 117, fig. 1.
1824. *Rana megastoma* Spix, p. 27, pl. 4, fig. 1 (type locality, Solimões, Brazil).
1826. *Stombus cornutus.*—Fitzinger, 1826, p. 65; 1843, p. 32.
1829. *Ceratophrys spixii* Cuvier, note on p. 106 (type locality, Surinam?).—Duméril and Bibron, 1841, p. 440.
1829. *Ceratophrys daudinii* Cuvier, note on p. 106 (type locality, Surinam?).—Duméril and Bibron, 1841, p. 440.
1830. *Ceratophrys dorsata* (not of Wied, 1824).—Wagler, 1830, p. 204 (part).—Duméril and Bibron, 1841, p. 431 (part).
1837. *Ceratophrys cornuta.*—Schlegel, 1837, pl. 10, figs. 1, 2.—Peters, 1873a, p. 204.—Ernst, 1877, p. 281.—Boulenger, 1882a, p. 224; 1898b, p. 131.—Gadow, 1901, p. 216.—Baumann, 1912, pp. 93, 161.—Werner, 1912, p. 361, pl.—Beebe, 1919, p. 208.—Miranda-Ribeiro, 1920b, pp. 301, 303; 1926, p. 127, pl. 16, fig. 1.—Nieden, 1923, p. 381.—A. Lutz, 1927, p. 40.—Crawford, 1931, p. 32.—Mello-Leitão, 1937, p. 292.—Röhl, 1949, p. 406, fig. 185.—Lutz and Kloss, 1952, p. 636.—Ginés, 1959, p. 110.—Rivero, 1961, p. 86.—Gorham, 1963, p. 16.
1838. *Phrynoceros vaillanti* Tschudi, p. 82 (type locality, Surinam).
1843. *Phrynoc[eros] vaillantii.*—Fitzinger, 1843, p. 32.
1858. *Ceratophrys megastoma.*—Günther, 1858, p. 25.—Jimínez de la Espada, 1875, p. 26.
1945. *Ceratophrys testudo* Andersson, p. 22, fig. 8 (type locality, Río Pastaza, eastern Ecuador).—Gorham, 1963, p. 16.

Description.—USNM 146251, an adult male from Leticia, Amazonas, Colombia. No vomerine teeth; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border free and slightly notched; snout very broad, rounded when viewed from above, slanting forward and flat in profile, the upper jaw extending very slightly beyond the lower. Nostrils directed upwards, scarcely projecting, located on anterior slope of the snout a trifle nearer to anterior corner of eye than to edge of jaw. Canthus rostralis blunt; loreal region nearly flat, not well differentiated, merging gradually with the upper lip. Eye small, sunken, its diameter two-fifths its distance from tip of snout; a single "horn" on upper eyelid, about three-fourths as long as width of eyelid; interorbital diameter twice that of upper eyelid, greater than interval between nostrils. Tympanum distinct, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to twice its own diameter. Fingers moderate, with very weak lateral ridges and slightly bulbous tips, free, first finger a little longer than second, fourth longer than either, reaching beyond base of penultimate phalanx of third; a flat oval thumb pad present; a larger, indistinct palmar callus; metacarpal tubercles well developed. Toes one-half webbed, third toe slightly longer than fifth, its tip reaching to base of antepenultimate phalanx of fourth; a long blunt inner metatarsal tubercle, and a larger flat outer one; a heavy tarsal ridge, ending near heel; a series of skinfolds on heel and knee. Body very stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches angle of mouth; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are widely separated. Skin of upper parts finely granular with many coarse tubercles in more or less regular diagonal series from the shoulders backwards; a specially strong row of tubercles along the V-shaped median bony section of back, the tubercles fused into longtudinal ridges anteriorly, the bony area nearly smooth between these ridges; venter coarsely granular, with small tubercles on throat and lower surface of femur; a very heavy glandular ridge from posterior corner of eye above tympanum, ending in a prominent swelling just behind tympanum; a large flat gland on proximal anterior femur; no skinfold across chest; no ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 94 mm.; head length, 45 mm.; head width, 63 mm.; femur, 38.5 mm.; tibia, 37.5 mm.; foot, 36.5 mm.; hand, 30.5 mm.

Color in alcohol.—Dorsum olive gray, the median dorsal area dull olive buff darkening to drab-gray on occipital and supratympanic areas; a slate-black spot with irregular outer borders from behind the eyes bordering the longitudinal ridges and tubercles, and two shorter irregular dark spots on dorsolateral region and upper part of sides; a narrow sepia band between the eyes extending to tips of "horns"; muzzle in front of this band drab-gray with a darker canthal stripe descending to edge of mouth; side of head drab-gray with two or three irregular drab spots crossing it diagonally and a few small black spots surrounding small tubercles near edge of lip; limbs drab to drab-gray with two very wide seal brown to clove brown crossbands; venter pale Naples yellow, immaculate except for some small drab spots on lower limb surfaces and a clove brown suffusion over the throat of the male; anterior femur pale olive-buff, the gland Naples yellow; posterior femur pale crab-gray with fine sepia marblings; palms of hands and soles of feet slate gray, the tubercles and tips dull olive-buff.

Remarks.—Frogs of cannibalistic habit are seldom plentiful, but it is hoped that others of this species may be found in Colombia so that some estimate of variation may be possible. The example just described has been compared with USNM 127141 from Puerto Santa Clara, Orellana, Peru, and the two were found to be practically identical in structure, proportions, and color pattern, except that the latter, being a female, had a pale olive-gray throat.

This species is closely related to *Ceratophrys varia* Wied (=*dorsata* Tschudi) found in Brazil. Although Nieden's key separates these two species on the basis of a bony shield in the center of the back, present in *varia* but supposedly absent in *cornuta*, the shield is present in both forms. In *varia*, however, vomerine teeth are present although small; in *cornuta* they are lacking. The toes of *varia* are webbed only at the base, while those of *cornuta* are about one-half webbed. The color patterns are much the same, however.

A young specimen (MLS 52) from Villa María, Caldas, has the following measurements in millimeters: head and body, 27; head length, 12.5; head width, 16.5; femur, 10; tibia, 10; foot, 10.5; hand, 8.5.

Colombian Specimens Examined

AMAZONAS: Leticia, USNM 146251.
CALDAS: Villa María, MLS 52.

Genus *Edalorhina* Jiménez de la Espada

1871. *Edalorhina* Jiménez de la Espada, p. 58 (type species, *E. perezi* Jiménez de la Espada).

Generic diagnosis.—Pupil horizontal. Tongue oval, notched, and free behind. Vomerine teeth present or absent. Tympanum distinct. Fingers free; toes free or nearly so, the tips not dilated. Outer metatarsals united. Sternum with a bony style. Sacral diapophysis slightly dilated. Terminal phalanges simple.

***Edalorhina perezi* Jimínez de la Espada**

PLATE 45G–I

1871. *Edalorhina perezi* Jimínez de la Espada, p. 58 (type locality, banks of the Río Napo, Ecuador); 1875, p. 160, pl. 1, fig. 5.—Boulenger, 1882a, p. 227, pl. 16, fig. 2.—F. Müller, 1884, p. 281.—Trewavas, 1933, p. 424, figs. 15, 16.—Myers, 1942, p. 151.—Dunn, 1949, p. 2, fig. 1.—Gorham, 1963, p. 16.

Description.—USNM 146954, a young frog from Puerto Nariño, Amazonas, Colombia. A rough, bony ridge between the eyes, extending diagonally forward toward edge of upper eyelid; vomerine teeth in two very small, round, well-separated patches behind the choanae; tongue three-fifths as wide as mouth opening, elongate, cordiform, its posterior border free and deeply notched; snout moderate, truncate at the tip when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis rounded, marked by a series of elongate glands; loreal region vertical, flat, with a furrow below where it meets the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter equal to that of upper eyelid, a trifle less than interval between the nostrils. Tympanum distinct, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers without terminal disks, with lateral ridges, free, first and second fingers subequal, fourth finger longer than either, reaching to base of penultimate phalanx of third; a small oval thumb pad present; a larger rounded palmar callus; metacarpal tubercles well developed. Toes slightly webbed at the base, long, without disks, third and fifth toes subequal, their tips reaching the base of antepenultimate phalanx of fourth toe; a small oval inner metatarsal tubercle, and a smaller rounded outer one; a distinct tarsal ridge curving across the tarsus, beset with irregular tubercles, the largest of which is on center of tarsus; a distinct skinfold on heel and knee. Body fairly stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches to posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts minutely warty, with heavy warts and glands at regular intervals along back, but not in a linear connected series as the dorsolateral glands; a heavy glandular ridge across head, ending in a fringe of short "horns" on upper eyelid; a very thick lateral fold, standing out from the body and edged with large tubercles; venter smooth, a weak glandular ridge from posterior corner of eye above tympanum, ending on shoulder; no skinfold across chest; no ventral disk; probably a median external vocal sac in the male.

Dimensions.—Head and body, 22 mm.; head length, 7.5 mm.; head width, 7.5 mm.; femur, 9 mm.; tibia, 10 mm.; foot, 8.5 mm.; hand, 5.5 mm.

Color in alcohol.—Dorsum sepia, with a clove brown area bordering the dorsolateral ridges above; venter immaculate drab gray except for a large brown mark beginning behind tympanum, covering side behind axilla halfway to groin, and turning forwards along side of belly to and just below axilla; groin with a smaller clove brown dot on the pale drab inguinal glands; a short brown bar across posterior part of belly level with groin; proximal half of lower femur pale drab, distal half clove brown, broken with light areas near the knees; lower tibia with seven or eight small dark brown spots alternating on either side; posterior surface of femur seal brown, with an anterior prolongation of the distal brown femoral spot nearly reaching the anal region; upper lip pale drab; canthus, tympanum, and tip of snout seal brown.

Remarks.—All the specimens listed here belong in the first column of Dunn's (1949, p. 5) table headed "vomerine teeth present" under his subgroup having "*perezi*" warts, i.e., with the warts more or less uniformly scattered over the upper surface and not arranged in connected linear rows as they are in his "*plicifrons*" style of warts. Furthermore, a very distinct wart appears on the tip of the snout in the nine adults, and it is almost equally developed in all of them. A small wart is present on the snouts of the 17 young specimens from Santa Rita, Solimoens River, Brazil. All have a very definite interocular ridge.

The color of the snout is sometimes whitish, with a tan canthal line and with another line running diagonally from below the nostril to the upper lip, as in BM 80.12.5.194a. In USNM 146954–6 and in BM 1915.3.9.17 the snout is completely brown in front of the interocular ridge. In four others (USNM 127928 and BM 1900.11.27.45 from Peru, and BM 80.12.5.194b and 81.7.8.11 from Ecuador) the snout is light just anterior to that ridge but it darkens toward the tip.

The largest specimen (BM 80.12.5.194a from Canelos, Ecuador) has the following measurements, in millimeters: total length, 40; head length, 13; head width, 13.5; femur, 16; tibia, 17.5; foot, 16; hand, 11. Its adpressed heel reaches to the posterior corner of the eye, as in the example described above.

The collecting of specimens in Amazonas, Colombia (USNM 146954–6 from Puerto Nariño and JRT 104 from Leticia), extends the known range of this species considerably to the east of that given by Dunn (1949, map, p. 8), and the two frogs from Santa Rita, Solimoens River, Brazil, constitute a record for western Brazil. Persistent search should bring to light more specimens from the Amazon and its tributaries, perhaps even from the Putumayo drainage, as Dunn suggested.

Until more of these rare frogs have been collected and studied, it seems best to consider as full species Boulenger's *Edalorhina buckleyi*, 1882, and his *E. nasuta*, 1912, and Cope's *Bubonius plicifrons*, 1874.

Specimens Examined

COLOMBIA

Amazonas; Leticia, JRT 104; Puerto Nariño, USNM 146954–6.

BRAZIL: Amazonas: Santa Rita, Solimoens River, BM 1915.3.9.16–7.

ECUADOR: Canelos, USNM 145790, BM 80.12.5.194a–c; Puerto del Mairo, BM 81.7.8.11; Sarayacu, BM 80.12.5.283.

PERU: Huanuco: Ceja de Montana, JP 0747 (7). Orellana: Santa Clara, Sta. G5, USNM 127182; Domo Santa Clara, USNM 127928–31; Parene, BM 1900.11.27.45. Satipo: Marankiari, JP 0058.

Genus *Eleutherodactylus*

1841. *Eleutherodactylus* Duméril and Bibron, p. 620 (type species, *E. martinicensis*).

Generic diagnosis.—Pupil horizontal. Tongue subcircular or oval, entire or slightly notched and free behind. Vomerine teeth present. Tympanum generally distinct. Fingers free or nearly so; toes free or webbed; all digits with dilated disks. Outer metatarsals united. Omosternum cartilaginous; sternum a cartilaginous plate. Terminal phalanges T-shaped.

The members of the genus *Eleutherodactylus* have received at least 20 generic names. Myers (1962, pp. 195–302) has made an appraisal of all these names and his work should be consulted as an aid in the study of this genus.

Eleutherodactylus is very diversified in northwestern South America, where speciation is high and variation within a species in nearly all characters is considerable; hence, the constructing of an adequate "key" in the style of Boulenger and Nieden has become almost impossible.

The members of this genus appear to fall into natural groups, however, and it is by defining the predominant characters of each group that the following key has been constructed. The student not already familiar with this puzzling genus may find it necessary in keying a certain frog to compare several descriptions of those forms lying nearest to that selected in the key, as such features as forward extension of heel, degree of webbing, development of disks, and other characters vary considerably even in individuals of the same form and from the same locality.

The 33 forms of *Eleutherodactylus* that are recognized in this paper appear to fall in four main groups. While no single characteristic may fit every species or subspecies now included within a group, most of the characteristics will apply to adults. Immature frogs are not yet sufficiently known to point out their differences in proportion and coloring here.

Group I: Long-legged, smooth-bellied frogs with smooth heads, fairly large in size; no bony ridges on head.

Group II: Granular-bellied, shorter-legged frogs usually having a frontoparietal depression; bodies moderately long; no bony ridges on head.

Group III: Small frogs, usually with U- or)(-shaped gular folds in the male; often with pointed toes; no bony ridges on head.

Group IV: Medium-sized to large frogs, usually with bony ridges on head or some ossification of head skin and skull.

Keys to Colombian Species of *Eleutherodactylus*

GROUP 1: Head without bony ridges; frontoparietal depression indistinct or absent; belly usually smooth, at least anteriorly, sometimes with transverse wrinkles or fine granules posteriorly; heel reaching a point between nostril and beyond snout tip, except in *E. bufoniformis*.

*a*¹. Heel reaching anterior corner of eye; vomerine teeth transverse, heavy, narrowly separated; toes slightly webbed; back with tubercles and glandular ridges; size to 81 mm. . . . . **E. bufoniformis**

*a*². Heel reaching from nostril to far beyond snout tip.
  *b*¹. First finger longer than second.
    *c*¹. Toes free or slightly webbed; size to 47.5 mm. . . **E. conspicillatus**
    *c*². Toes one-half webbed; size to 52.5 mm. . . . . **E. anomalus**
  *b*². First and second fingers subequal, or first shorter than second.
    *c*¹. First and second fingers subequal.
      *d*¹. Toes at least one-fourth webbed.
        *e*¹. Throat, chest, and belly immaculate white; no distinct dark diagonal spots near knee; soles and palms pale brown; toe disks not much darker than rest of foot; back smooth; not more than one or two black tubercles above shoulder; distance of nostril from snout tip three-fourths the distance from nostril to eye; size to 68 mm. . . . . **E. raniformis**
        *e*². Throat, chest, and belly dark-spotted; several dark, diagonal spots near and on knee; soles and palms black; toe disks often dark; back minutely granular; distance between nostril and tip of snout one-third that from nostril to eye; often three black tubercles above shoulder; size to 56 mm. **E. longirostris**
      *d*². Toes webbed at base only.
        *e*¹. Dorsum pale tan with sharp, thin, dark chevrons; first and second fingers with very small disks; size to 40.5 mm. **E. brederi**
        *e*². No distinct pattern of dark dorsal chevrons; disks of inner fingers not unusually small; size to 33.5 mm. . . . . . . **E. lymani**

- *c*². First finger shorter than second.
  - *d*¹. Diameter of eye equal to distance from eye to tip of snout; toes slightly webbed.
    - *e*¹. Interorbital diameter 1½ times the width of upper eyelid; tympanum small, its diameter one-fourth that of eye; diameter of disk of third finger and of fourth toe equal to three-fourth the diameter of tympanum; belly often finely granular posteriorly; usually a tubercle on upper eyelid; heel reaching from anterior corner of eye to just beyond snout tip; size to 28.5 mm. **E. calcaratus**
    - *e*². Interorbital diameter equal to width of upper eyelid; diameter of tympanum one-half that of eye; disk of third finger two-thirds the area of tympanum, that of fourth toe one-half the area of tympanum; size to 42 mm. . . . . **E. terraebolivaris**
  - *d*². Diameter of eye equal to three-fourths the distance from eye to tip of snout; interorbital diameter equal to width of upper eyelid; diameter of tympanum equal to one-half that of eye; size of disk of third finger and of fourth toe equal to area of tympanum; belly smooth anteriorly, often finely granular posteriorly; size to 59 mm. . . . . **E. w-nigrum**

GROUP II: Head without heavy bony ridges; usually a distinct frontoparietal depression; belly more or less granular; heel usually not reaching beyond tip of snout. (The fine skin glands and ridges on the heads of some species in this group should not be mistaken for the relatively heavy bony ridges characteristic of Group IV. These dermal ridges on the head sometimes appear in quite young individuals of Group II but may not be present at all in others of the same species. The ridges apparently do not have bony ridges beneath them. The degree to which the tubercles and glands between the shoulders and in other places on the back is emphasized by dark pigment is highly variable, as is the development of such tubercles and glands.)

- *a*¹. No vomerine teeth; belly finely granular; size to 20.5 mm. . . **E. palmeri**
- *a*². Vomerine teeth present.
  - *b*¹. Tympanum concealed; toes faintly webbed.
    - *c*¹. Upper jaw projecting slightly beyond lower; pronounced lateral ridges on fingers; size to 39 mm. . . . . **E. surdus cabrerai**
    - *c*². Upper jaw projecting well beyond lower; no lateral ridges on fingers; size to 28 mm. **E. delicatus**
  - *b*². Tympanum usually distinct, although sometimes small.
    - *c*¹. Heel not reaching beyond posterior corner of eye.
      - *d*¹. Back finely granular.
        - *e*¹. Digital disks fairly large; interorbital diameter 1½ times the width of eyelid.
          - *f*¹. Toes free; heel reaching to posterior corner of eye; size to 31.5 mm. **E. bogotensis**
          - *f*². Toes slightly webbed; heel reaching to posterior border of tympanum; size to 32 mm. . . . . **E. lehmanni**
        - *e*². Digital disks very small; toes slightly webbed; heel reaching to front of shoulder; interorbital diameter almost twice the width of eyelid; size to 21.5 mm. . . . . **E. nicefori**
      - *d*². Back smooth; interorbital diameter 1½ times the width of eyelid; toes webbed at base; heel reaching to posterior corner of tympanum; size to 45.5 mm. . . . . **E. elegans**

c^2. Heel reaching to between posterior corner of eye and tip of snout.

d^1. Back finely or coarsely granular or tubercular.

e^1. Toes distinctly webbed; disk of third finger larger than tympanum; disk of fourth toe smaller; interorbital diameter equal to width of upper eyelid; size to 47 mm. . . **E. sanctae-martae**

e^2. Toes unwebbed, or with only a trace of web; digital disks normal or large.

f^1. Disk of third finger and of fourth toe a little larger than tympanum; interorbital diameter twice the width of upper eyelid; size to 28 mm. . . . . **E. affinis**

f^2. Disk of third finger and of fourth toe two to three times area of tympanum.

g^1. Toes and fingers shorter; dark blotches but no distinct chevrons on back; size to 52 mm. . **E. latidiscus latidiscus**

g^2. Toes and fingers longer; three to four dark chevrons on back; size to 55.5 mm. . . . . **E. latidiscus tamsitti**

d^2. Back smooth or pustular; belly finely or coarsely granular.

e^1. Diameter of eye equal to length of snout.

f^1. Toes free; heel reaching to nostril; size to 32 mm. **E. carmelitae**

f^2. Toes slightly webbed.

g^1. Heel reaching to tip of snout; size to 27 mm. **E. taeniatus**

g^2. Heel reaching to anterior border of eye (to between ear and eye in original description); size to 54.5 mm. . **E. insignitus**

e^2. Diameter of eye less than length of snout; interorbital diameter equal to or greater than width of upper eyelid.

f^1. Tubercles on outer tarsus, heel, or upper eyelid, or sometimes a sinuous ridge; size to 33.5 mm. . . . . . . **E. cruentus**

f^2. No tubercles on outer tarsus, eyelid, or heel.

g^1. Heel to center of eye.

h^1. Interorbital diameter slightly greater than width of upper eyelid; disk of third finger equal to nearly one-half the area of tympanum; size to 34 mm. **E. erythropleurus**

h^2. Interorbital diameter 1½ times the width of upper eyelid; disk of third finger as large as tympanum; size to 36 mm. **E. vertebralis**

g^2. Heel reaching to anterior border of eye or tip of snout.

h^1. A dark)–(-mark between shoulders or traces of such a mark; size to 21.5 mm. . . . . **E. frater**

h^2. Back without distinct markings; interobital diameter equal to width of upper eyelid; size to 34.5 mm. **E. megalops**

GROUP III: Head without bony ridges; males with U- or)(-shaped heavy gular folds; tips of digits often pointed; size small.

a^1. Disk of third finger and of fourth toe two or three times the size of tympanum; fingers free, toes free or barely webbed.

b^1. Belly finely granular, immaculate; size to 22.5 mm . **E. lehmanvalenciae**

b^2. Belly smooth, often spotted; size to 25.5 mm . . . . . . **E. diastema**

a^2. Disk of third finger and of fourth toe not quite as large as tympanum; belly smooth, immaculate; fingers with very small webs, toes often nearly one-fourth webbed; size to 23.5 mm . . . . **E. gularis**

GROUP IV: Head with bony ridges, or some ossification of skin and skull; size medium to large (only one form known to be Colombian) . . . . **E. cornutus**

Eleutherodactylus bufoniformis (Boulenger)

PLATE 50A–F

1896. *Hylodes bufoniformis* Boulenger, p. 19 (type locality, Buenaventura, Valle, Colombia).—Nieden, 1923, p. 440.

1946. *Eleutherodactylus bufoniformis.*—Breder, 1946, p. 404.—Goin, 1959a, p. 135.—Gorham, 1963, p. 17.

Description.—CNHM 54597, an adult from La Selva, Pueblo Rico, Caldas, Colombia. Vomerine teeth in two heavy, narrowly separated, transverse triangular series behind the choanae; tongue half as wide as mouth opening, thick, cordiform, its posterior border free and distinctly notched; snout broadly rounded when viewed from above, straight and sloping forwards in profile, the upper jaw extending slightly beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis blunt; loreal region nearly flat, sloping strongly to the upper lip. Eye large, prominent, its diameter about five-sixths its distance from tip of snout; interorbital diameter three-fourths that of upper eyelid, equal to interval between nostrils. Tympanum small but distinct, its greatest diameter a little less than one-third that of eye, separated from eye by an interval equal to 1½ times its own diameter. Fingers fairly short, their tips bulbous but scarcely enlarged, with faint lateral ridges, free, first finger longer than second and equal to fourth, the tip of which reaches to base of penultimate phalanx of third; a large elongate thumb pad present; a weak palmar callus; metacarpal tubercles well developed. Toes long, nearly one-eighth webbed, third toe much longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering about one-half the tympanum and much better developed than disks of fingers; a prominent, elongate inner metatarsal tubercle, the outer one scarcely visible; a faint tarsal ridge, ending halfway to heel; a heavy skinfold on heel and knee. Body very stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches anterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts shagreened, and with small tubercles or short rows of glands thickly scattered everywhere; several enlarged tubercles on upper eyelid; venter smooth, except for some transverse ridges across posterior belly; a short, wide glandular ridge from posterior corner of eye, ending above tympanum; a weak skinfold across the chest; a ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 81 mm.; head length, 28 mm.; head width, 37.5 mm.; femur, 37 mm.; tibia, 41 mm.; foot, 34 mm.; hand, 20.5 mm.

Color in alcohol.—Dorsum Indian purple, with a paler interorbital bar, and some wood brown spots irregularly scattered between the glandular areas; upper surfaces of limbs clove brown, with faint russet diagonal stripes between the wider and darker stripes; side of head Indian purple, with a few paler drab spots along upper lip and below eye; side of body dull sepia, the groin mottled with large irregular white (yellow in life?) splotches; posterior femur clove brown mottled with white spots above and below the knee; anterior femur more faintly but regularly mottled with dark and light; venter wood brown, the throat and chest with a fine sepia vermiculation; a few sepia spots on anterior belly; lower limb surfaces heavily vermiculated with sepia and pale wood brown; soles and palms dull clove brown, the tubercles a little lighter.

Remarks.—There are individual differences in the roughness of the backs of frogs in the series at hand. Some are relatively smooth, as in the specimen described, while others have as many as eight broken rows of glandular ridges across the back. Rugosities on the upper eyelids also vary, sometimes being elongated into one or more short dermal "horns," and sometimes evident only as some blunt tubercles. The pattern is not always the same, for some frogs are light tan or gray with well-marked pale glandular ridges and others are dark, as in the described specimen.

Specimens Examined

COLOMBIA

Caldas: La Selva, Pueblo Rico, CNHM 54314, 54580–7, 54593–600; Santa Cecilia, Pueblo Rico, CNHM 54579, 54592.

Chocó: Quesado River, tributary of Atrato River, AMNH 13603; Sierra de Baudó, ANSP 25675.

Valle: Cisneros, Valle de Cauca, CNHM 44064.

COSTA RICA: Gutierez, MCZ 19412–4

ECUADOR: Pastaza River, MCZ 19628.

PANAMA: Barro Colorado Island, USNM 118197, 118669, 148147; Cerro Azul, USNM 140051–2; La Loma, USNM 139898, MCZ 19416–9; Río Chanille, MCZ 9962. Cerro Punta, Chiriquí, USNM 148053; Armila, San Blas, USNM 150083–5.

***Eleutherodactylus conspicillatus* (Günther)**

Plate 51a–f

1858. *Hylodes conspicillatus* Günther, p. 92 (type locality, Andes of Ecuador); 1859a, p. 89.—Boulenger, 1880, p. 46; 1882a, p. 204, pl. 14, fig. 2; 1882c, p. 465; 1891, p. 135; 1898a, p. 120; 1913, p. 1025.—F. Müller, 1882b, p. 167.—Cope, 1887a, p. 48.—Peracca, 1904, p. 24; 1914, p. 104.—Despax, 1911, p. 40.—Baumann, 1912, p. 161.—Fowler, 1913, p. 161.—

Miranda-Ribeiro, 1923, p. 831, pl.; 1926, p. 55, fig. 32.—Nieden, 1923, p. 452.—Mello-Leitão, 1937, p. 292.

1868. *Lithodytes conspicillatus.*—Cope, 1868, p. 115; 1874b, p. 127.

1959. *Eleutherodactylus conspicillatus.*—Stebbins and Hendrickson, 1959, p. 528.—Gorham, 1963, p. 17.

Description.—USNM 150669, an adult from Montañita, Caldas, Colombia. Vomerine teeth in two short, heavy, slanting, well-separated series behind the choanae; tongue large, two-thirds as wide as mouth opening, broadly cordiform, its posterior border free and notched; snout elongate, rounded at the tip when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout equal to one-half their distance from eye. Canthus rostralis distinct; loreal region concave, flaring outwards to the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter about 1¼ times that of upper eyelid, equal to interval between the nostrils. Tympanum distinct, its greatest diameter three-fifths that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers very long, with distinct lateral ridges, free, first finger slightly longer than second, fourth longer than either, reaching beyond base of penultimate phalanx of third, the disk of which covers one-fourth the tympanum; a heavy oval thumb pad present; a bifid palmar callus; metacarpal tubercles well developed. Toes moderately long, faintly webbed, third toe a little shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering one-fourth the tympanum, and about equal to that of third finger; a small but prominent inner metatarsal tubercle, and a minute round outer one; a weak tarsal ridge extending one-third of the distance to heel; a pronounced skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches beyond tip of snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts pustular, with a few weak granules behind tympanum and on sacrum; upper eyelid with a patch of small pointed granules, and a single pointed tubercle on heel; sides granular anteriorly, pustular in the groin; venter smooth anteriorly, granular on posterior part of belly; a thin but sharp glandular ridge from posterior corner of eye above tympanum, ending behind it; a slight skinfold across the chest; a prominent ventral disk; probably a pair of lateral external vocal sacs in male.

Dimensions.—Head and body, 49 mm.; head length, 19 mm.; head width, 18.5 mm.; femur, 25 mm.; tibia, 29 mm.; foot, 25 mm.; hand, 14.5 mm.

Color in alcohol.—Dorsum prune purple; upper limb surfaces dark olive, with three black bars on legs; side of body seal brown to sepia with a few small black spots in groin; venter buff, the posterior part of belly nearly immaculate, the sides, chest, and throat with many small sepia spots; side of head black, with a few lighter brown squarish spots along upper lip; edges of lower jaw sepia, with five or six small buff spots along margin; tip of snout buff; posterior femur dark olive with a fine dark and light reticulation; soles of feet and palms of hands dull seal brown, the tubercles and disks olive-gray; a dark postanal triangle present.

Remarks.—In the series of specimens of *Eleutherodactylus conspicillatus* at hand from Bolivia, Peru, and Ecuador, as well as from Colombia, the critical measurements show relatively little variation.

While *conspicillatus*, *raniformis*, and *longirostris* are very similar in form and color, a few minor differences serve to distinguish them in the examples at hand.

Considering the critical measurements, the head length of *conspicillatus* (65 specimens) is on the average proportionately shorter than that of *raniformis* (74 specimens), while it overlaps with that of *longirostris* (52 specimens). The head width is not significantly different in the three species. The femur is shorter in *conspicillatus* than in the other two species, although the difference is not very great. The tibia of *conspicillatus* is shorter than that of *raniformis* but barely overlaps with that of *longirostris*. The foot measurements of all three species overlap, although those of *conspicillatus* tend to be shorter. The hand measurements also overlap, but those of *longirostris* are slightly shorter. Thus, the body proportions are not of much assistance in separating these three forms.

The degree of webbing on the toes is a fairly effective way of distinguishing *conspicillatus*, as the toes are slightly to about one-eighth webbed in some 90 percent of the examples and up to one-fourth webbed in only about 10 percent. None of the specimens of *longirostris* examined has the toes less than one-fourth webbed, while most have them one-third webbed. *E. raniformis* has the toes one-fourth to one-half webbed. In all three forms the adpressed heel reaches usually far beyond the snout tip, but sometimes only to the nostril. A pointed tubercle often occurs on the heel in *conspicillatus*, although it is sometimes represented only a by glandular ridge.

The form here called *conspicillatus* has the belly immaculate posteriorly, with some fine dark dots along the sides and on chest, while the chin has irregular dark spots. Its throat is often brown-spotted, while a row of 10 or 12 large dark squarish spots occurs along the edge of the lower jaw. *E. longirostris* usually has an immaculate belly, although there are often scattered dark dots on the anterior half, and the throat spots sometimes are arranged beside a median light stripe down the center of the throat. *E. raniformis*, on the other hand, has an immaculate belly and throat, with perhaps some small dusky spots around the edge of the lower jaw.

Both *conspicillatus* and *longirostris* have unusually sharply outlined dark triangular postanal patches, although these are paler in some individuals. No distinct dark postanal patch occurs in *raniformis*, but the area behind the anus is often darkened. Dark parallel diagonal bars occur on the upper proximal surface of the femur and on the knee in *conspicillatus* and *raniformis*, while the spots in that region in *longirostris* are not usually so regularly placed.

Two or three very dark circular spots surround the glands situated behind the ear to well above the arm insertion in *longirostris*. In *conspicillatus* and *raniformis* usually only the inner, uppermost gland is dark, and often the glands are no darker than the rest of the dorsal skin.

All three forms have the disks on the first and second fingers much smaller than those on the third and fourth fingers, unlike *w-nigrum*, which has the disk of the second finger about as large as that of the fourth finger and the disk of the first finger not unusually small.

Two frogs (CNHM 54352–3) from La Selva, Pueblo Rico, Caldas, have dorsal markings very similar to those of the figured type of Boulenger's *achatinus*, but these specimens have the toes one-eighth webbed, have the heel reaching beyond the snout, and show numerous other differences in bodily structure from typical *achatinus;* hence, they have been identified tentatively as *conspicillatus*.

Specimens Examined

COLOMBIA

Antioquia: Andes, AMNH 14139, 14142–3; Angelópolis, AMNH 39234, 39239–43, 39251, 39253–4; Caicedo, CNHM 68729–30; Caldas (town), MLS 404; Jericó, MZUM 71311, 73422; Medellín, AMNH 38753–4, 39083, 39089; Medellín Valley, AMNH 38781, 38790, 39467–8, 39476–7; Urrao, Santa Barbara, CNHM 69728.

Bolívar(?): Terra Alta, CNHM 61797, 61799–800, 61804; Upper Sinú River(?), CNHM 61819.

Caldas: La Selva, Pueblo Rico, CNHM 54230, 54507–8, 54320, 54329, 54331, 54352–3, 54358; Montañita, USNM 150657–70; Samaná, Río Hondo, CNHM 69732; Pereira, MLS 164; Santa Cecilia, Pueblo Rico, CNHM 54350–1.

Chocó: Peña Lisa, Condoto, BM 1913.11.12.97–100.

Huila: San Adolfo, Acevedo, CNHM 69737.

Nariño: Guiatarilla, CNHM 54392; La Guayacana, CNHM 61818.

Putumayo: Río Rumiyaco, CNHM 54322.

Santander: El Centro, CNHM 81763; MLS 113, 113a.

Tolima: MZUM 56436a–e; Honda, BM 1909.7.23.28.

Valle: Bitaco, BM 1909.4.30.77–8.

BOLIVIA: Actinero, BM 1901.8.2.43; Charuplaya, 1,310 m., BM 1902.5.29.106–8; San Ernesto, Maperi, 1,500 m., BM 1901.8.2.53; Sara Province, BM 1904.10.29.83–101.

ECUADOR: Western part, BM 60.6.16.95, 60.6.16.102–3, 60.6.16.107 (probably cotypes). Cachabé: BM 89.3.1.29; Chiriboya, 5,000 ft., BM 1940.2.20.1. Intac: BM 78.1.25.23–4; 10 km. west of Loja City, 3,000 m., USNM 98931; Paitanga, BM 80.12.5.275. Pambelar: BM 1901.6.27.13–6; Sarayacu, BM 80.12.5.229, 80.12.5.249.

PERU: Dagomro Pass, 1,000 m., BM 1900.11.27.39; La Unión, Carabaya, Río Huancamayo, USNM 145786; BM 1907.5.7.22, 1907.5.17.14–16, 1911.12.20.-40–1; Marcapata Valley, BM 1902.5.29.196; Mazamari, Satipo, JP 0046–7, 0059; Santo Domingo, Carabaya, 6,000 ft., BM 1902.11.20.14.

Eleutherodactylus anomalus **(Boulenger)**

PLATE 49A–C

1898. *Hylodes anomalus* Boulenger, 1898a, p. 119, pl. 14, fig. 2 (type locality, Cachabé, Ecuador).—Nieden, 1923, p. 447, fig. 323.

1963. *Eleutherodactylus anomalus.*—Gorham, 1963, p. 16.

Description.—BM 98.4.28.99 (a syntype), from Cachabé, Ecuador. Frontoparietal area not noticeably depressed. Vomerine teeth in two heavy, arc-shaped, slightly separated, nearly transverse series behind the choanae; tongue half as wide as mouth opening, broadly oval, its posterior border free and very faintly notched, snout moderately long, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis rounded; loreal region flat above, then sloping outwards to the upper lip. Eye large, very prominent, its diameter equal to its distance from tip of snout; interorbital diameter three-fourths that of upper eyelid; equal to interval between nostrils. Tympanum small, its greatest diameter one-third that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers very short, their tips bulbous, but not dilated into disks, without lateral ridges, free, first finger a little longer than second, fourth longer than either and reaching halfway on the terminal phalanx of third; a large swollen thumb pad present; a small bifid palmar callus; metacarpal tubercles well developed. Toes moderately long, one-half webbed, and all with well developed disks, third toe longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering half of the tympanum; a heavy tarsal ridge, ending two-thirds of distance to heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches just beyond tip of snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels fail to meet.

Skin of upper parts slightly granular, with heavy glandular ridges outlining a nearly square area behind eyes, across back above shoulders, and between eyes; a glandular dorsolateral fold from posterior eye nearly to level of groin; several short longitudinal glands on posterior lumbar and sacral regions; venter smooth, except for some transverse folds on posterior abdomen; a short heavy glandular ridge from posterior corner of eye above tympanum, ending just behind it; a heavy conical tubercle on lower jaw below commissure, and several others above shoulder and along side of body; a skinfold across chest; traces of a ventral disk; a pair of external lateral vocal sacs in the male.

Dimensions.—Head and body, 52.5 mm.; head length, 20.5 mm.; head width, 22 mm.; femur, 25.5 mm.; tibia, 27.5 mm.; foot, 22 mm.; hand, 11.5 mm.

Color in alcohol.—Top of head olive, back walnut brown, glandular ridges outlined with clove brown and with a few indistinct diagonal russet marks paralleling them; side of body olive-buff, with small sepia vermiculations in front of groin; limbs wood brown above, the femur with four or five wide sepia crossbars, a narrow dark bar between each pair, the tibia, foot, and forearm with more-irregular dark bars; posterior femur primrose yellow with heavy clove brown reticulations; throat marbled with pale sepia and buff; belly immaculate pale buff; side of head dull cream-buff with three or four wide sepia spots along upper lip; palms of hands and soles of feet drab, the disks and tubercles on toes a little lighter, the webs with small drab dots on a lighter ground.

Remarks.—It might seem that this frog belongs in Group I, in which most members have the first finger longer than the second; however, its lack of finger disks—in fact, its entire hand structure—makes it truly "anomalous" among other species of that group.

Three examples from Colombia agree very well with the type except that the webs on their inner toes are a trifle longer, and in one of these examples the adpressed heel does not extend beyond the tip of the snout. The similarities, however, are much more striking than these small differences, which would no doubt be bridged over in a larger number of examples.

Specimens Examined

COLOMBIA

Antioquia: Quebrada Valdivia, 900 m., Valdivia, CNHM 63882; Urabá, Río Currulao, CNHM 63879–80.

Bolívar: Alto de Quimarí, 500 m., CNHM 61813.

Caldas: Santa Cecillia, Pueblo Rico, USNM 147230–1: CNHM 54356, 54602–5.

Chocó: Río San Juan, 10–15 km. west of Playa de Oro, USNM 147210–1; Mutis, USNM 151291; Pizarro, CNHM 44103–8.

Valle: Río Calima near Córdoba, USNM 145771.

ECUADOR: Cachabé: BM 98.4.28.99 (syntype).

***Eleutherodactylus raniformis* (Boulenger)**

PLATE 48D–F

1896. *Hylodes raniformis* Boulenger, p. 19 (type localities, Buenaventura and Cali, Valle, Colombia; 1914, p. 813.—Nieden, 1923, p. 439.
1963. *Eleutherodactylus raniformis.*—Gorham, 1963, p. 18.

Description.—USNM 124235, a young adult from Andagoya, Chocó, Colombia. Vomerine teeth in two short, heavy, narrowly separated patches behind the choanae; tongue about three-fourths the width of mouth opening, cordiform; snout moderate, rounded when seen from above and in profile, the upper jaw projecting well beyond the lower, which is bluntly rounded anteriorly; nostrils superolateral, their distance from end of snout three-fourths their distance from eye. Canthus rostralis indistinct, the loreal region with a deep longitudinal furrow on its lower border above the flaring upper lip. Eye large, prominent, its diameter three-fourths its distance from end of snout; interorbital diameter equal to that of upper eyelid and to interval between nostrils. Tympanum distinct, its diameter two-thirds the width of eye, separated from eye by one-half its own diameter. Fingers moderately long, free, with very faint lateral ridges, first and second fingers subequal, fourth finger much longer and reaching to base of disk of third; disk of third finger covering about one-half the tympanum; a projecting oval pad on base of first finger, and a larger but flatter palmar callus; metacarpal tubercles well developed. Toes long, one-fourth webbed, with distinct lateral ridges, third toe a little longer than fifth and reaching to base of antepenultimate phalanx of fourth; disks of toes a trifle smaller than those of fingers, disk of fourth toe covering about one-third the tympanum; a prominent oval inner metatarsal tubercle and a small, weak outer one; a distinct inner tarsal ridge which fades out half way to heel. Body moderate, in postaxillary region considerably narrower than greatest width of head. When hind leg is adpressed, heel reaches to a point between nostril and tip of snout; when limbs are laid along the side, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap considerably. A heavy ridge above and behind tympanum, ending above the shoulder. Skin entirely smooth above and below, except for a few weak. granules below the vent. A more or less well-marked ventral disk Apparently no external vocal sacs.

Dimensions.—Head and body, 41 mm.; head length, 15 mm.; head width, 16 mm.; femur, 20 mm.; tibia, 22 mm.; foot, 21 mm.; hand, 11 mm.

Color in alcohol.—Dorsum wood brown, with a darker band between the eyes, a dark chevron-shaped mark between the shoulders, and a faint square spot on center of back in front of sacrum; a dark line from nostril to eye, continued above and behind tympanum; upper lip pale olive buff with faint brown spots; legs with faint dark crossbands, posterior femur mottled with fine olive-buff spots on a wood brown background; venter pale olive buff, immaculate; soles of feet and palms of hands pale spotted with wood brown.

Remarks.—The dorsal surface is usually fawn color, sometimes with a slightly darker triangular patch between the eyes, followed by a faint chevron extending to the sacrum. The glandular ridge above and behind the tympanum is black, and almost always is followed by a small oval black spot just above the arm insertion and by a second black spot near the dorsolateral fold a little behind the first one. These two spots mark the presence of skin glands. The postanal region is dark brown in most examples, but there is no wide, triangular postanal patch as in most specimens of *E. longirostris* and *E. conspicillatus.*

The maximum size of *E. raniformis* is 68 millimeters.

In the 63 frogs measured, the heel reaches to beyond the tip of snout in 94 percent and to the nostril or the tip of snout in 6 percent. The toes are nearly or quite one-half webbed in about 27 percent, one-third webbed in 44 percent, and one-fourth webbed in 29 percent.

It is easy to confuse the large and long-legged frogs in this group—*raniformis, longirostris, palmatus,* and *conspicillatus.* Of those having the toes one-fourth or more webbed, *raniformis* has an immaculate light throat and belly; *palmatus* has a brown-spotted throat and white belly; and *longirostris* has both throat and belly spotted with brown. Other differences are noted under *conspicillatus.*

In the original descriptions, *raniformis* and *palmatus* are stated to have the first finger distinctly longer than the second, while in *longirostris* these two fingers are about the same in length. In *raniformis* the posterior surface of the femur is whitish reticulated with dark brown; in *palmatus* it is black with numerous small yellowish spots—the reticulations of *raniformis* carried to extremes, resulting in a dark ground with some light spots. In *longirostris* the posterior femur is a uniform brown.

E. conspicillatus has only a trace of web at the base of the toes, a distinct dark anal patch, and the venter immaculate and pale except for a few small dusky spots around the edge of the lower jaw.

E. fitzingeri, described by O. Schmidt from the Cordilleras of New Granada (=Darién, Panama, probably to Chocó, Colombia), apparently is related to the frogs just mentioned, but the lack of detail in the original description does not allow it to be positively identified with any of them. It may be a synonym of *conspicillatus.*

Specimens Examined

COLOMBIA

Antioquia: Puerto Berrio, CNHM 30809.

Caldas: La Selva, Pueblo Rico, 1,700 m., CNHM 54608–11.

Chocó: Andagoya, CNHM 81846–7, USNM 144791–800, 150449–57, 124235–6, BM 1916.4.25.26; El Valle, USNM 151290; Boca de la Raspadura, AMNH 13685–6; Istmina, upper San Juan River, CNHM 15644–5; Las Animas Creek, Quito River, tributary of the Atrato, AMNH 13606; Mutis, USNM 151291; Novita, Rio San Juan, MCZ 15422; Peña Lisa, Condoto, DZSP 10561 (formerly BM 1914.5.21.63); Pizarro, CNHM 44073–4; Quibdó, AMNH 13687; Sierra de Baudó, AMNH 25673–4; Sierra de Darién, AMNH 25676.

Cundinamarca: Finca El Cuchero, near Tocaima, USNM 144801–2.

Meta: El Centro, CNHM 81737, 81763.

Nariño, La Guayacana, ANSP 25678.

Santander: El Centro, USNM 147135–7, 150458–80, MLS 189, CNHM 81737, 81763.

Tolima: Mariquita, USNM 144803–8, CNHM 81830–2.

Valle: Buenaventura, USNM 124175, 144810–7, 150481–7; Río Anchicayá, USNM 144809; Río Calima near Córdoba, USNM 145756–70; Virology Field Station, Río Raposo, USNM 151439–41, 151443, 151446, 151448.

Eleutherodactylus longirostris (Boulenger)

Plate 47d–f

1898. *Hylodes longirostris* Boulenger, 1898a, p. 120, pl. 15, figs. 1, 1a (type locality, Cachabé, Ecuador).—Despax, 1911, p. 40.—Nieden, 1923, p. 446, fig. 332.

1959. *Eleutherodactylus longirostris.*—Goin, 1959, p. 130.—Gorham, 1963, p. 17.

Description.—USNM 124265, an adult from near Quebrada Santa Ana, a tributary of Río Opogodó, Chocó, Colombia. Vomerine teeth in small, heavy, well-separated patches behind the choanae; tongue two-thirds the width of mouth opening, oval, with a notch in its free posterior border; snout long, rounded when seen from above, tip almost truncate in profile, the upper jaw projecting considerably beyond lower; nostrils lateral, their distance from end of snout about one-third their distance from eye, separated from each other by an interval slightly less than their distance from eye. Canthus rostralis very sharply projecting, with a slight furrow below it where the flat loreal region juts out to the flaring upper lip. Eye large, prominent, its diameter about two-thirds the length of snout; interorbital diameter equal to width of upper eyelid, equal to interval between the nostrils. Tympanum distinct, two-thirds the diameter of eye, separated from eye by one-half its own diameter. Fingers long, free, not ridged, first, second, and fourth fingers subequal, their tips enlarged into truncate disks, disk of third finger equal to about one-third the diameter of tympanum; a heavy pad on base of first finger, and a larger, semidivided palmar callus; metacarpal tubercles large and well-developed; toes long, about one-fourth webbed, third toe much longer than fifth and reaching to base of antepenultimate phalanx of fourth; toe disks a little larger than those of fingers, disk of fourth toe equal to one-half the diameter of tympanum; a large oval inner and a small round outer metatarsal tubercle; tubercles of toes well developed, smaller than the inner metatarsal tubercle; a rather weak tarsal ridge, which fades out halfway to heel. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches far beyond tip of snout; when limbs are laid along the sides, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. Skin of upper parts minutely granular; a row of small glands between the eyes, and two other rows of glands from above the tympanum diagonally to center of back; a heavy glandular ridge from posterior corner of eye, above and behind tympanum, ending at shoulder. Venter smooth, except for a few granulations around anus. Ventral disk rather indistinct. No external vocal sac.

Dimensions.—Head and body, 56 mm.; head length, 21 mm.; head width, 19.5 mm.; femur, 29 mm.; tibia, 34.5 mm.; foot, 28 mm.; hand, 14 mm.

Color in alcohol.—Dorsum light cinnamon brown; dark-bordered hour-glass-shaped longitudinal sepia marking extending from interorbital region to sacrum, where it fades out; three round black spots covering tubercles above the shoulder (on some specimens, only the upper one is distinct); a heavy black line bordering the supratympanic glandular fold; top of femur with seven or eight alternately narrower and wider dark crossbars, the wider ones continuing less distinctly on upper tibia and foot; similar but fewer crossbars on forearm; venter cream color, with numerous sepia spots on chin and throat; two larger dark spots on each side of breast below shoulder, and several widely scattered dots on anterior half of belly; side of body cinnamon, with faint diagonal sepia stripes becoming darker anteriorly and appearing as series of small dark dots behind axilla; anterior femur pale cinnamon with several short black diagonal spots near and on knee; outer half of tibia sepia, with a row of hazel spots forming a stripe along its lateroventral border; posterior femur cinnamon with some very small, indistinct, darker spots below anus and along lateroventral border; sometimes a dark distinct posterior anal patch; sides of head ecru drab, the loreal region and tympanum dark cinnamon; upper lip cream-buff with several small dark spots, alternately larger and smaller, bordering edge of lip; soles of feet and palms of hands chocolate, the tubercles slightly paler, the disks often darker below.

Remarks.—The first and second fingers are subequal in about 25 percent of the specimens examined; the first finger is slightly to considerably longer than the second in the remaining 75 percent. The dorsal skin is faintly to heavily granular in more than half the examples, pustular or shagreened in the others.

The dark postanal patch is distinct in less than half the examples at hand. There are two or three black shoulder tubercles in nearly all specimens. The knee has wide dark diagonal stripes near it in nearly all specimens. The venter is spotted in about 66 percent of the specimens and is immaculate in the remaining 34 percent. The throat has a median light stripe down its center in 75 percent.

While there is no significant variation in the six critical measurements of *E. raniformis* (74 examples from Antioquia to Nariño) and of *E. longirostris,* including *palmatus* and Dunn's "*fitzingeri*" (52 examples from Nicaragua, Costa Rica, Panama, Ecuador, and Chocó to Putumayo in Colombia), there nevertheless seems to be a fairly constant color difference. The throat in *longirostris* usually is somewhat to quite dark-spotted, but in many Panamanian examples there is a white median area down the center of the throat, with the dark spots grouped in a more-or-less regular longitudinal border on either side of it. This same throat pattern occurs in CNHM 54384–90 and 54588 from Caldas. The throat of *raniformis* is immaculate. Often there are three black tubercles marking the shoulder in *longirostris,* while one (or sometimes two at the most) occurs there in *raniformis.* A distinct dark triangular patch covering the postanal area is found in many examples of *longirostris,* this patch being especially evident in the young. No definite postanal marking can be seen in *raniformis,* although the postanal region is often suffused with a dark tone.

Some of the Valle examples, freshly collected, are somewhat like the Panama frogs identified by Dunn as *fitzingeri* except that the former have a slightly longer snout, a smaller tympanum, and much smaller light dots on the posterior femur.

Most young examples show more of the fine granulations on the belly than do the adults. The pattern is often more distinct, consisting of two wide dark chevrons, the first above the shoulders, the second just before the sacrum, and continuing on the sides as diagonal stripes. The throat is often pale in the center, and with dark spots on both sides. The very dark distal bar on the femur and the dark spots on the knee are usually present, and are diagnostic of this species.

Specimens Examined

COLOMBIA

Antioquia: Jericó, AMNH 22605–7, Chigorodó, USNM 151892; Ventanas, 50 km. northwest of Yarumal, MLS 353.

Caldas: Pereira, MLS 317. Near Salamina, north of Manis, MLS 321; Santa Cecilia, Pueblo Rico, CNHM 54384–90, 54588–9; Villa Maria, USNM 146974–9.

Cauca: Gorgona Island: Prison Camp, USNM 145137.

Chocó: Andagoya, BM 1915.10.21.66–7, USNM 144781–8, 145788 (formerly BM 1916.4.25.26); Caño Sando, tributary of Rio Pepé, lower Río Baudó, USNM 144789; Condoto, BM 1910.7.11.57; Peña Lisa, 300 ft., BM 1913.11.-12.96, 1914.5.21.82; Quesado River, tributary of the Atrato, AMNH 13599–601; Río San Juan, 10–15 km. west of Playa de Oro, USNM 147212–6; Near Quebrada Santa Ana, tributary of Rio Opogodó, USNM 124265.

Huila: Cave of the Guacheros, 20 km. south of Palestina, USNM 148824–58 (juv.).

Nariño: Imbilí, Río Mira, USNM 147451–6; Río Mataje, USNM 147321–92; Río Satinga, USNM 147482.

Putumayo: Mocoa, CAS 85176.

Valle: Virology Field Station, Río Raposo, USNM 151402–38, 151442–5, 151449, 151457–8; Camp Carton de Colombia, lower Calima River, USNM 149728–33; 32 km. from Cali via Mar Laguna El Carman, USNM 148798–9.

COSTA RICA: Guapilco, MCZ 11844; Suretka, MCZ 9788–9, 9791–2.

ECUADOR: Bulim, MCZ 7600; Río Durango, MCZ 3891–2; San Xavier, MCZ 7599.

NICAGAGUA: Tuli Creek, MCZ 7328–9.

PANAMA: Barro Colorado Island, MCZ 17879, 24222: El Hato, Chiriquí, USNM 129379; Lagunas Verde, USNM 67004; Madden Dam, MCZ 24255–8; Río Tapio, MCZ 9976, 10003–6; Río Tocumen, MCZ 9991–2.

***Eleutherodactylus brederi* Dunn**

Plate 47a–c

1934. *Eleutherodactylus brederi* Dunn, p. 1 (type locality, Chalichiman's Creek, Darién, Panama).—Breder, 1946, p. 405.—Gorham, 1963, p. 16.

Description.—ANSP 24392, an adult from east base of Cordillera of Bogotá and extreme limit of llanos, Cundinamarca, Colombia. Vomerine teeth in two short, slanting, widely separated series behind the choanae; tongue two-thirds as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout long, but rounded at the tip when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-third their distance from eye. Canthus rostralis distinct; loreal region flat and nearly vertical, its lower border flaring to the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter nearly twice that of upper eyelid, a little greater than interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers long, the disks of first and second much smaller than those of third and fourth, all with lateral ridges, free, first finger equal to second, fourth longer than either, its tip reaching almost to base of disk of third which covers one-half the tympanum; an oval thumb pad present; a small, indistinct palmar callus; metacarpal tubercles well developed. Toes long, webbed at base, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering about one-fourth the tympanum and much smaller than that of third finger; a small but prominent spadelike inner metatarsal tubercle and an indistinct, minute outer one; no apparent tarsal ridge; a heavy skinfold on heel and knee. Body slender, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches beyond snout tip; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels greatly overlap. Skin of upper parts finely shagreened, with some short, weak, diagonal glandular ridges on shoulders and sacrum; a fine dorsolateral fold from posterior corner of eye to groin; venter smooth except for many fine transverse skinfolds across belly and some small granules in front of groin and in lateroventral region; a very sharp glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a heavy skinfold across chest; a distinct ventral disk; a pair of lateral vocal sacs in the male.

Dimensions.—Head and body, 40.5 mm.; head length, 16 mm.; head width, 14 mm.; femur, 19.5 mm.; tibia, 24.5 mm.; foot, 18.5 mm.; hand, 11 mm.

Color in alcohol.—Dorsum fawn color, the dorsolateral lines emphasized by a narrow dark cinnamon line which begins at top of snout and extends along canthus; a narrow cinnamon interorbital bar and one or two cinnamon chevrons down center of back, the first one on a level with the arm insertion; upper limb surfaces fawn color, with three wide but faint crossbars outlined with cinnamon on femur, tibia, and foot and two rather indistinct bars on forearm; side of body ecru drab, with some indistinct darker diagonal stripes; side of head drab to russet, with some darker and lighter spots from eye to upper lip; venter dull clay color, immaculate; posterior femur fawn color, immaculate; soles of feet and palms of hands drab, the webs and disks a little paler.

Remarks.—ANSP 24393 from the same locality as the described specimen resembles that specimen except that it has a dark W centered on its back and its posterior femur has a very fine network of drab surrounding small paler dots.

In the seven specimens at hand, the adpressed heel extends to the nostril, to the tip of the snout, or to just beyond the snout. From one to three very small heel tubercles may occur, or the heel may have only some transverse ridges of skin.

In the original description, the close relationship of this frog to *noblei* was pointed out. It is also said to be allied to *gollmeri*, from which it differs in having enlarged disks on the two outer fingers only, in having a dorsolateral fold, and in its color. From *noblei* it differs in its dorsal markings and in the presence of a dorsolateral fold, while it agrees with that species in having a similar arrangement of disks on the fingers. Dunn considered it as the respresentative of *noblei* on Darién, Panama.

The closest relative of *E. brederi*, however, appears to be *E. achatinus* (Boulenger), described first from Cachabé, western Ecuador. Boulenger's figures of the type are identical in pattern with ANSP 24392 (from near Bogotá), which Dunn identified as *brederi*. The chief differences, as taken from the respective original descriptions, are as follows:

Character	*E. brederi*	*E. achatinus*
Snout	1½ times diameter of eye.	Equal to diameter of eye.
Interorbital diameter	1½ to nearly 2 times width of upper eyelid.	Equal to width of upper eyelid.
Tympanum	Two-thirds the diameter of eye.	One-third to one-half the diameter of eye.
Toe disks	Moderate in size.	Small.

In addition, critical measurements show the foot averaging shorter in *brederi* and longer in *achatinus*.

Specimens Examined

COLOMBIA

Caldas: La Selva, Pueblo Rico, CNHM 54321, 54391–417, 54500, 82015; Santa Cecilia, Pueblo Rico, CNHM 54350–1.

Cauca: El Tambo, Río San Juan de Michenque, ANSP 25424–6; Río San Juan, CNHM 54354.

Chocó: Andagoya, CNHM 81839–40.

Cundinamarca: East base of Cordillera of Bogotá and extreme limit of llanos, ANSP 24392–3.

Putumayo: Río Rumiyaco, CNHM 54322.

Santander: El Centro, MLS 113, 113a.

Valle: Virology Field Station, Río Raposo, sea level, USNM 151389–94; three km. east of Cali, USNM 148797; Cisneros, CNHM 44065–8, 44070, Camp Carton de Colombia, lower Calima River, USNM 149734–5.

***Eleutherodactylus lymani* Barbour and Noble**

Plate 48a–c

1920. *Eleutherodactylus lymani* Barbour and Noble, p. 403 (type locality, Perico, Valley of the Chinchipe, northwestern Peru).—Barbour and Loveridge, 1929, p. 261.—Gorham, 1963, p. 17.

Description.—MCZ 54336 (paratype), from Palambla near Huancabamba), northern Peru. Vomerine teeth in two small, slanting, widely separated series behind the choanae; tongue slightly more than half as wide as mouth opening, cordiform, its posterior border free and slightly notched; snout broadly rounded at tip when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils more lateral than dorsal, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis sharp; loreal region flat, the upper lip flaring out below it. Eye large, prominent, its diameter 1⅓ times its distance from tip of snout; interorbital diameter a trifle wider than that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers long, slender, with distinct lateral ridges, free, first and second subequal, fourth a little longer than either and reaching nearly to base of disk of third, which covers about one-fourth the tympanum; a long oval thumb pad present; a smaller palmar callus; metacarpal tubercles well developed. Toes webbed only at the base, long, third and fifth subequal, their disks reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering about one-sixth the tympanum and smaller than that of third finger; a small oval inner metatarsal tubercle; outer tubercle not distinguishable from other pustules on sole of foot; a fin-like tarsal ridge, ending at heel; a heavy skinfold on heel and knee. Body slender, in postaxillary region much narrower than greatest width of head. When hind leg is adpressed, heel reaches far beyond snout; when limbs are laid along the sides, knee and elbow overlap greatly; when hind legs are bent at right angles to body, heels overlap greatly. Skin of upper parts coarsely pustular (or very finely granular) with two pairs of weak V-shaped glands between shoulders; a distinct narrow dorsolateral line from posterior margin of eyelid to groin; venter smooth anteriorly except for some irregular linear glands; posterior belly finely granular, posterior and lower femur more coarsely granular; a narrow glandular ridge from posterior corner of eye above tympanum, ending behind tympanum; two small round glands behind lower edge of tympanum; a skinfold across chest; a ventral disk; probably external vocal sacs in the male.

Dimensions.—Head and body, 33.5 mm.; head length, 12 mm.; head width, 12.5 mm.; femur, 17.5 mm.; tibia, 21.5 mm.; foot, 17 mm.; hand, 10 mm.

Color in alcohol.—Above fawn color with traces of a faint dark crossband between the eyes, and two or three faint V or VV marks on back outlining glands; faint dark crossbars on legs; venter buff, with dusky dots on throat and chest; posterior femur buff, with very faint darker marblings above; side of head buff, with pale brown dots on loreal and snout regions, and seven dark triangular marks along upper jaw.

Remarks.—The single Colombian example (MZUM 73423 from Villavicencio, in Meta) of this species was so identified in the Museum of Zoology, University of Michigan, but it also appears to resemble *E. conspicillatus* rather closely. For lack of conclusive material, this species is included here, as it may eventually be discovered in the

Colombian states bordering Peru, its type locality. In the Meta frog, as well as in the five Peruvian examples (including two paratypes of *E. lymani*), the adpressed heel reaches beyond the snout, either slightly or considerably. The toes are distinctly webbed at the base. The venter may be finely granular to nearly smooth but with a wrinkled appearance. There are no pronounced heel tubercles, but most examples have one or two small ridges crossing the heel.

Specimens Examined

COLOMBIA

META: Villavicencio, MZUM 73423.

BRAZIL—VENEZUELA BOUNDARY: Salto da Hua, USNM 83576.

PERU: Bellavista, MZUM 55774a–c; USNM 118189 (paratype); Palambla, near Huancabamba, MCZ 54336 (paratype); Huachuma, Piura, JP 0705.

Eleutherodactylus calcaratus **(Boulenger)**

PLATE 50G–I

1908. *Hylodes calcaratus* Boulenger, p. 516 (type locality, San Antonio [probably in Chocó]).—Nieden, 1923, p. 440.

Description.—BM 1910.7.11.63, an adult male from Río San Juan, Chocó, Colombia. Vomerine teeth in two small, slanting, nearly contiguous series behind the choanae; tongue a little over one-half the width of mouth opening, cordiform, its posterior border free and notched; snout moderately long, rounded when viewed from above, broadly rounded in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis distinct, straight; loreal region concave, slanting outwards to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; a small conical tubercle on upper eyelid; interorbital diameter about 1½ times that of upper eyelid and slightly greater than interval between nostrils. Tympanum small but distinct, its greatest diameter approximately one-fourth that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers long, slender, with lateral ridges, free, first finger shorter than second, fourth longer than either and reaching nearly to base of disk of third, which covers three-fourths the tympanum, an oval thumb pad present; a partly divided palmar callus; metacarpal tubercles well developed. Toes long, the first and second with a slight web, the others unwebbed, third toe shorter than fifth, the disk of which reaches midway on antepenultimate phalanx of fourth; disk of fourth toe covering about three-fourths the tympanum and equal to that of third finger; a small but distinct semilunar inner metatarsal tubercle and a smaller round outer one; a tarsal ridge, ending halfway to knee; a conicle tubercle on heel and a skinfold on heel and knee. Body slender, in postaxillary region much less than greatest width of head. When hind leg is adpressed, heel reaches beyond snout tip; when limbs are laid along the sides, knee and elbow greatly overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts finely granular, with a few short diagonal ridges on anterior part of back, and some larger pustules [in original description, "smooth above and below," but the type was a young frog measuring only 17 mm.]; belly granular; throat and chest smooth; a small heel tubercle present; a distinct glandular ridge from posterior corner of eye above tympanum, ending behind it; a skinfold across chest; a ventral disk probably present, not very distinct in this specimen; a pair of external lateral vocal sacs in the male.

Dimensions.—Head and body, 28.5 mm.; head length, 11 mm.; head width, 10 mm.; femur, 14 mm.; tibia, 16 mm.; foot, 12.5 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum cinnamon, the tops of the pustules a little lighter; venter cream buff, with a network of very fine drab dots that become concentrated into regular series of spots along the lower lip border and also on the lower limb surfaces; upper surface of femur wood brown, with four regular russet crossbars continued on upper parts of tibia and foot, and similar markings on forearm, posterior femur wood brown, the light-topped granules making a pale network; anterior femur pale cinnamon, with anterior extensions of the russet crossbands along the whole area. Side of body cream buff with indistinct brown marblings. Side of head cream buff, loreal region russet; a wide subocular russet spot, and a few smaller spots between eye and nostril, usually reaching the edge of the upper lip. Soles of feet and palms of hands buff with brown spots, the lower surface of the finger disks dark brown, the fingers ringed with brown.

Remarks.—In the original description, the adpressed heel of the type was said to reach a point between the eye and the tip of the snout, but in the frog just described it reaches somewhat beyond the snout.

Some of the frogs from Huila, Meta, and Cauca have a wide, light middorsal stripe and a sharp black tubercle above the shoulder; and many show traces of dorsolateral skinfolds. They seem to resemble *E. cruentus*, except that the digital disks are smaller, not covering the tympanum.

In two series of specimens (USNM 150780–95, 151024–5) from Finca La Granja, Sierra de Santa Marta, Magdalena, that are presumed to be *E. calcaratus* there are variations in pattern and structure.

These specimens have the belly pale olive-buff to pale gray, with few to many small drab to cinereus dots on throat and chest; in a few examples the belly also is spotted; and one specimen has pale coral pink suffusion on throat. The back is clove brown, drab or smoke gray, with a dark gray interorbital bar and some irregular marbled gray spots outlined narrowly with white from shoulders to sacrum. One specimen has a short pair of dark lines near middle of back and a wider, longer pair of dorsolateral stripes to above anus. In one the center of the back is fawn color with a wide faint gray middorsal stripe, the sides being gray. A wide slate black stripe extends from tip of snout along canthus and behind eye, ending above arm; sometimes there is a detached slate spot above and behind axilla. On the legs are three wide gray white-edged crossbars. Below, the posterior femur is immaculate or with small gray dots; above, with prolonged ends of crossbars. Palms and soles are gray to drab, the digital disks usually darker.

In these specimens the heel may reach to the nostril or to slightly beyond the snout. The first finger is always shorter than the second, and the toes are not distinctly webbed. A small heel tubercle usually can be found. The head averages very slightly wider than long.

The dark "robber mask" so obvious in all of the Finca La Granja frogs is not apparent in the rather faded British Museum specimen described above. The latter shows some traces of the heavy leg markings, and a small heel tubercle can be discerned. Positive identification of the Finca La Granja frogs cannot be made until they have been compared directly with the type.

Specimens Examined

COLOMBIA
- Cauca: Quintana, near Popayán, CNHM 44116–20, 44124–5, 54327.
- Chocó: Río San Juan, BM 1910.7.11.63.
- Huila: San Adolfo, Acevedo, CNHM 69737.
- Meta: Buenavista, CNHM 81809; Macarena, CNHM 81335–6; Río Renjifo, Serranía de La Macarena, CNHM 81349–60, 81366; Villavicencio, CNHM 30911, 81801–9, MLS 93.
- Magdalena: Finca La Granja, on road to San Lorenzo, Sierra de Santa Marta, USNM 150780–95, 151024–5 (all tentatively identified).
- Putumayo: Umbría, MZUM 61778.
- Tolima: MZUM 56437; Quindío Mountains, USNM 118190, CNHM 7983.

Eleutherodactylus terraebolivaris Rivero

Plate 46d–f

1952. *Eleutherodactylus gollmeri* (not of Peters).—Aleman, 1952, p. 26.

1961. *Eleutherodactylus terraebolivaris* Rivero, p. 58 (type locality, Rancho Grande, Estado Aragua, Venezuela); 1964a, p. 298; 1964b, p. 311.

Description.—USNM 147011, an adult male from Villavicencio, Meta, Colombia. Vomerine teeth in two short, slanting, narrowly separated series behind the choanae; tongue two-thirds as wide as mouth opening, oval, its posterior border free and distinctly notched; snout broadly rounded when viewed from above, nearly truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout one-fourth their distance from eye. Canthus rostralis straight, distinct; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter nearly as great as its distance from tip of snout; interorbital diameter equal to that of upper eyelid, a little greater than interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers long, with slight lateral ridges, free, first finger shorter than second, fourth longer than either, its tip extending to base of disk of third, which covers two-thirds the tympanum; a small oval thumb pad present; a bifid palmar callus; metacarpal tubercles well developed. Toes long, not webbed, third toe shorter than fifth, the disk of which reaches halfway along antepenultimate phalanx of fourth; disk of fourth toe one-half the tympanum, and a trifle smaller than that of third finger; a small inner metatarsal tubercle and a smaller outer one; no apparent tarsal ridge; a heavy skinfold on heel and knee. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches just beyond tip of snout; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap considerably. Skin of upper parts finely tubercular with some larger tubercles on the shoulders and sacrum, and a pair on top of snout; venter smooth anteriorly, very finely granular on center and posterior belly and on lower proximal surfaces of femur; a heavy glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a distinct skinfold across the chest; a ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 42 mm.; head length, 15 mm.; head width, 15.5 mm.; femur, 20 mm.; tibia, 23 mm.; foot, 18.5 mm.; hand, 12 mm.

Color in alcohol.—Dorsum pale drab with a wide, faint sepia band between the eyes; the tubercles on top of snout and those on shoulders outlined with crescentic sepia markings; a weak sepia chevron across lumbar region, and other nearly transverse bars on sacrum; canthus rostralis with traces of a dark line; sides of head drab, the upper lip with several small dark triangular spots, the posterior ones leading to the eye; a larger dark spot behind tympanum; sides of body drab-gray, with a few small dark spots following the diagonal rows of small tubercles; limbs drab gray with three or four wide broken darker crossbars; posterior femur drab; a sepia postanal patch; venter olive-buff, the lower lip, center of throat and belly with many small pale drab spots; palms of hands and soles of feet light fawn color, the tubercles and disks light gray.

Remarks.—This variable and abundant species seems to be mostly confined in Colombia to the states east of the Andes, in the vast area drained by the Amazon's tributaries. The Colombian frogs vary in about the same way as the Venezuelan paratypes at hand, some having much darker markings than others, with more distinct dorsal chevrons and ventral spots. The dark-encircled tubercles on shoulders and top of snout are apparent in nearly all examples, however. The canthus sometimes has a sharply defined dark stripe, continued along the ridge encircling the upper part of the tympanum. The adpressed heel sometimes reaches only to the anterior margin of eye, but often to beyond the tip of the snout.

The Venezuelan paratypes of this frog tend to have somewhat longer legs than their Colombian counterparts. In other characteristics the frogs from both countries are so similar that it does not seem necessary to assign another name to the Colombian population.

Specimens Examined

COLOMBIA

AMAZONAS: Araracuara, Río Caquetá, USNM 144738; Río Sencella, tributary of upper Río Caquetá, USNM 144737; Leticia, MLS 59; Puerto Nariño, MLS 19, 21.

META: Caño Guapaya, Sierra de La Macarena, USNM 147269–70, CNHM 81335–6; Camp Las Ranas, La Macarena, USNM 144751–9; Medina, USNM 146995–7; Mouth of Caño Losada, USNM 144739–50; Villavicencio, USNM 146998–7011, CNHM 81801–8; Río Renjife, Serranía de La Macarena, CNHM 81349–60, 81364.

VAUPÉS: Alto Río Cuduyarí, tributary of lower Río Vaupés, USNM 144760–8; Cerro de las Pinturas, upper Río Inírida, tributary of Río Guaviare, USNM 140290–2, 144769–74; Alto Río Cuquiari, MLS 83, 83a.

BRAZIL: Salto da Hua, Rio Maturaca, USNM 83558.

VENEZUELA: Aragua: Rancho Grande, Pico Periquito, USNM 142387–8. Distrito Federal: Pico de Galipan, USNM 128836 (paratype). Miranda: Curupao, USNM 128884 (paratype); Los Canales, USNM 117527–36, 128807–34 (paratypes); Río Chacaito, USNM 128835 (paratype); Cerro Ya-Pacana, USNM 83950.

***Eleutherodactylus w-nigrum* (Boettger)**

PLATE 49D–F

1892. *Hylodes w-nigrum* Boettger, p. 28, footnote (type locality, Zurucuchi, Ecuador, near Cuenca).—Mertens, 1922, p. 164.—Nieden, 1923, p. 449.
1899. *Hylodes buergeri* Werner, p. 476 (type localities, Alto de Sibaté near Bogotá, Fusagasugá [in Cundinamarca].
1923. *Hylodes conspicillatus* (not of Günther).—Nieden, 1923, p. 452.
1944. *Eleutherodactylus buergeri.*—Dunn, 1944a, p. 71.
1963. *Eleutherodactylus w-nigrum.*—Gorham, 1963, p. 18.

Description.—USNM 146959, an adult female from Jericó, Antioquia, Colombia. Vomerine teeth in two short, slanting, well-separated series behind the choanae; tongue large, four-fifths as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout long, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout about two-fifths their distance from eye. Canthus rostralis distinct, straight; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter three-fourths its distance from tip of snout; interorbital diameter equal to that of upper eyelid, and to interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers long, with pronounced lateral ridges, free, first finger a little shorter than second, fourth longer than either and reaching to base of disk of third, which covers the whole tympanum; a narrow oval thumb pad present; a very indistinct small palmar callus; metacarpal tubercles well developed. Toes free or very slightly webbed, very long, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering the tympanum and equal to that of third finger; a small but pronounced inner metatarsal tubercle and a very indistinct smaller outer one; a narrow tarsal ridge, ending midway to heel; a heavy skinfold on heel and knee. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches far beyond snout; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap considerably. Skin of upper parts shagreened, with a few very small granules on sides and on sacral region; chest, throat, and anterior half of belly smooth; posterior half of belly, lower proximal parts of femur and below anus granular; a heavy glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a slight skinfold across the chest; indications of a weak ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 59 mm.; head length, 21 mm.; head width, 20.5 mm.; femur, 32 mm.; tibia, 38 mm.; foot, 35.5 mm.; hand, 18 mm.

Color in alcohol.—Dorsum dull russet; a clove brown band between the eyes; a pair of wide longitudinal clove brown stripes down either side of middorsal area, which is russet, the lateral margins of these clove brown stripes indistinct, but gradually lightening to cinnamon on the sides, where a series of four or five short diagonal rows of black spots begins just behind the axilla, continuing to groin and becoming larger there; a similar series of black spots, sometimes fusing into bars, on anterior and top of femur, abruptly ending in a rounded prolongation midway down the posterior femur and being outlined with a pale fawn-colored line near their termination; lower part of posterior femur with smaller black spots, the upper ones more or less alternating with the black femoral bars; tibia dusky russet above, with black bars which are smaller than those on femur; inside of tibia fawn color with small alternating dark spots; knee dull russet, the dark bars narrowed near it but emphasizing its outlines; venter tawny ochraceous, with some small gray dots on throat, chest, and lower limb surfaces; a series of dark crescentic marks around rim of lower jaw; side of head dull russet, with a black line just below canthus widening over nostril and reaching upper lip near tip of snout; two wide black bars from loreal region or eye to upper lip; soles of feet and palms of hands clove brown, the tubercles and disks dull russet.

Remarks.—The rounded black spots along the side of the body, becoming larger in the groin, occurring on the anterior and posterior surfaces of the femur and on the inside of the tibia, permit ready recognition of *w-nigrum.* The black W from which the specific name was derived is noticeable between the shoulders in some young individuals. Apparently this fades considerably, as it is scarcely visible in the older specimens at hand. The venter is sometimes immaculate, or some dusky dots may appear all over, or may be limited to the chin and throat. A series of small dark semicircular spots sometimes surrounds the rim of the lower jaw. While possessing the same glands across the back behind the head as in nearly all eleutherodactyli, these glands are not emphasized by a very dark color patch as they are in *raniformis* and *longirostris;* however, whenever the dark W-mark is strong it includes these glands.

Specimens Examined

COLOMBIA

ANTIOQUIA: Jericó, CNHM 71311, 73422, MCZ 19221, 24898–900, USNM 146957–62; Medellín, AMNH 38607, 38616, 38620; Ventanas, 50 km. northwest of Yarumal, USNM 150649–50.

CALDAS: Laguneta, near Salento, CNHM 44075–6, 44078, 44080–7, ANSP 25388–98; La Selva, Pueblo Rico, CNHM 54321; Pacora, MLS 360, 393; Santa Cecilia, Pueblo Rico, CNHM 54310.

CAUCA: Moscopán, ANSP 25407–9; Popayán, CNHM 54369; Quintana, 2,200 m., CNHM 54601; Río San Joaquín, CNHM 54323.

CUNDINAMARCA: Aguadita, ANSP 24403–4, 24407, MLS 184, 184a–b; East base of Cordillera of Bogotá, ANSP 24394.

HUILA: San Antonio, San Agustín, CNHM 69721–7.

MAGDALENA: East of San Miguel, Santa Marta, MCZ 4074.

META: Mountains of Medina, northwest of Villavicencio, MCZ 16272; Villavicencio, MLS 240.

NARIÑO: La Guayacana, ANSP 25706.

TOLIMA: Quindío Mountains, USNM 118194–6, MCZ 8262.

ECUADOR: Abitagua, 1,100 m., MZUM 92119a–b; Payamino, 300 m., MZUM 92123; Río Suno, 300 m., MZUM 92125.

Eleutherodactylus palmeri (Boulenger)

PLATE 54D–F

1912. *Hylodes palmeri* Boulenger, p. 189 (type locality, Pueblo Rico, 5,200 ft., Chocó [on modern maps just over the boundary line in Caldas], Colombia).—Nieden, 1923, p. 441.

1945. *Pseudohyla nigrogrisea* Andersson, p. 86 (type locality, Baños, eastern Ecuador).

1963. *Eleutherodactylus palmeri.*—Gorham, 1963, p. 18.

Description.—MLS 196, La Selva, Norte de Santander, Colombia. Vomerine teeth absent; the choanae small, rounded; tongue about one-half as wide as mouth-opening, elongate, its posterior third free and shallowly notched. Snout short, U-shaped when viewed from above, rounded in profile, the upper jaw extending but very slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis slightly defined; loreal region flat and slightly oblique, the upper lip flaring out a little below it. Eye moderate, not prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum very distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to one-third its own diameter. Fingers entirely without webs, fourth finger a little longer than second, just reaching to disk of third which slightly more than covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; toes without webs, third and fifth subequal, disk of fourth toe as large as disk of third finger and slightly more than covering the tympanic area; tubercles very indistinct; no tarsal ridge; no dermal appendage on heel. Body short, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the sides, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap greatly. No patagium extends from back of upper arm to side of body. Skin of upper parts smooth; a rather well developed narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult male, vocal sac subgular.

Dimensions.—Head and body, 20.6 mm.; head length 8 mm.; head width, 8.3 mm.; femur, 9.3 mm.; tibia, 11.3 mm.; heel-to-toe, 14.6 mm.; hand, 5.7 mm.

Color in alcohol.—A dark gray frog with no perceptible pattern. It is darkest gray on top of the snout and head, is an intermediate gray on the back and on the dorsal surfaces of the limbs, and is palest gray on the chin, chest, and belly.

Remarks.—Another example (CNHM 54760, from Santa Cecilia, Pueblo Rico, Caldas, at 800 meters on the Pacific side) has the dorsal surface covered with round dark spots becoming smaller on the limbs. The outer toes and fingers of this frog are slightly pointed, a condition not existing in the described specimen (MLS 196); otherwise, the two are quite similar. A much larger series is needed before an estimate of variation can be given.

As has been noted by B. Lutz and by Charles Walker (in lit.), the specimens in the type series of *Pseudohyla nigrogrisea,* which consists of one adult and five juveniles, are not *Hyla* but are damaged *Eleutherodactylus.*

Specimens Examined

COLOMBIA

Caldas: Pueblo Rico, Santa Cecilia, 800 m., CNHM 54760.
Norte de Santander: La Selva, MLS 196.

***Eleutherodactylus surdus cabrerai,* new subspecies**

Plate 52a–c

Holotype.—AMNH 14009, an adult female from Andes, Antioquia, Colombia, collected by Hno. Nicéforo María.

Diagnosis.—Head without bony ridges; vomerine teeth in two very small, transverse, widely separated series behind choanae; upper jaw projecting slightly beyond lower; diameter of eye a little less than its distance from tip of snout; tympanum concealed; first finger much shorter than second; toes faintly webbed, all with pronounced lateral ridges; adpressed heel reaching a point between eye and nostril.

Description of holotype.—No bony ridges on top of head. Vomerine teeth in two very small, widely separated, transverse series behind the choanae; frontoparietal area slightly depressed; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border free and deeply notched; snout moderate in length, rounded when viewed from above and in profile, the upper jaw extending slightly beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis rounded but distinct; loreal region deeply concave, sloping outwards to the upper lip. Eye large, prominent, its diameter a little less than its distance from tip of snout; interorbital diameter a trifle greater than that of upper eyelid, distinctly greater than interval between nostrils. Tympanum concealed, but with a depressed area where it would have normally occurred. Fingers fairly long, with pronounced lateral ridges, free, first finger much shorter than second, fourth longer than either, and reaching to base of disk of third which is about two-fifths the diameter of the eye; disks of the three outer fingers large, disk of inner finger very small; a short oval thumb pad present; a small bifurcate palmar callus; metacarpal tubercles well developed. Toes fairly long, with a trace of web, third toe much shorter than fifth, the disk of which reaches almost to base of penultimate phalanx of fourth; disk of fourth toe equal in width to that of third finger; a small but prominent inner metatarsal tubercle and a very small, indistinct outer one; an indistinct tarsal ridge, ending midway to heel; a series of skinfolds on heel and knee. Body fairly stout, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts pustular, with a few small tubercles above the shoulders and a single large tubercle on center of snout; sides finely granular; venter granular posteriorly, chin and chest nearly smooth; lower proximal surface of femur granular; a short glandular ridge from posterior corner of eye curving over the depression in the tympanic area; a skinfold across chest; a ventral disk.

Dimensions.—Head and body, 39 mm.; head length, 13 mm.; head width, 14.5 mm.; femur, 18 mm.; tibia, 20 mm.; foot, 18 mm.; hand, 12 mm.

Color in alcohol.—Dorsum dull drab, with a round clove brown spot on center of snout at base of median tubercle, and a wide, irregular interorbital clove-brown bar, followed by an elongate median chevron outlined with brown extending from above shoulders to sacrum; upper limb surfaces olive with three clove brown diagonal crossbars outlined with white (yellow?), sometimes enclosing another narrower dark bar; side of body wood brown with several darker diagonal lines crossing it; groin and proximal half of anterior femur tawny-olive with heavy dark brown vermiculations; posterior femur drab with the continuations of the bars across upper surface of femur; side of head dull drab, with two dark spots from eye to upper lip, and a dark stripe along canthus; venter wood brown, immaculate on belly but with irregular brown spots on chin fading out on chest; soles and palms wood brown, tips of toes sepia.

Remarks.—In the seven frogs at hand from the type locality, the toes are webbed faintly and the adpressed heel reaches from a point between the eye and the nostril to well beyond the snout. No true tympanum appears in any of these specimens, although the depth of the depression above the tympanic area varies from nearly plane with the surrounding head region to a very perceptible indentation, but without the bony rim or the tympanic disk found in frogs with true external tympani. The pattern varies somewhat. The dorsal chevron and the outlining dark lines are very much in evidence in AMNH 14008 and 14010 as well as in the type, while AMNH 14013–5, which are smaller, are much darker. AMNH 14011, an adult having the same length as the type, has a wide light middorsal stripe from tip of snout to above anus, and it has the slanting dark lines across the posterior back and sides as in the type. The belly is not always immaculate; it is covered with fine dark dots in four of these frogs. The dark spots on the chin appear as a wide dark V in 4 examples, with two or three narrow diagonal lines paralleling the areas of the V on either jaw.

The relationship of the new form to the *surdus* of Boulenger (1882a, p. 212, pl. 14, figs. 3, 3a) from "western Ecuador" and "South America" is quite obvious, but there are some differences. In the new form the nostrils are only half as far from the tip of the snout as they are from the eye, while in the nominate form they are equidistant from these points. In the Antioquia frog the interorbital diameter is a trifle greater than the width of the upper eyelid, but in the nominate *surdus* the interorbital diameter is equal to the width of the upper eyelid. The toes are faintly webbed in all examples of the new subspecies, but Boulenger says the toes are quite free in *surdus* (although BM 71.4.16.46 has them faintly webbed). Boulenger describes the dorsal skin of *surdus* as being smooth, but the northern representative of the species has a definitely pustular skin, with small tubercles above the shoulders and a single large median tubercle on the snout.

A specimen (CNMH 44069) that was collected in Cisneros, Valle, is so bleached that no pattern is apparent, but its structure and proportions seem to be the same as those of the examples of *E. surdus cabrerai.*

We are pleased to dedicate this new form to Sr. Isadore Cabrera, zoologist and collector.

Specimens Examined

COLOMBIA

ANTIOQUIA: Andes, AMNH 14009 (holotype) and 14008, 14010–1, 14013–5 (all paratypes).

VALLE: Cisneros, CNHM 44069.

Eleutherodactylus delicatus Ruthven

PLATE 57A–C

1917. *Eleutherodactylus delicatus* Ruthven, 1917c, p. 1, pl. 1 (type locality, San Lorenzo, 5,000 ft., Santa Marta Mountains, [Magdalena,] Colombia); 1922, p. 53.—Gorham, 1963, p. 17.

Description.—MZUM 54573, an adult female from San Lorenzo, Magdalena, Colombia. No bony ridges on frontoparietal area. Vomerine teeth in two transverse, short, narrowly separated series behind the choanae; tongue moderate, one-half as wide as mouth opening, squarish, its posterior border free and distinctly notched; snout moderately elongate, rounded when viewed from above and in profile the upper jaw projecting well beyond the lower jaw, which is quite truncate and somewhat concave anteriorly. Nostrils lateral, distinctly projecting, their distance from end of snout two-third their distance from eye. Canthus rostralis definite and angular; loreal region concave, with a slight furrow along border of upper lip. Eye large, prominent, its diameter about fourth-fifths its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, a little greater than interval between nostrils. Tympanum small but distinct, its greatest diameter two-fifths that of eye, separated from eye by an interval equal to three-fourths its own diameter. Fingers long, without lateral ridges, free, first finger shorter than second and with a small disk, fourth longer than either, reaching midway on penultimate phalanx of third, which nearly covers the tympanum; a rounded thumb pad present; a cordiform palmar callus; metacarpal tubercles well developed. Toes faintly webbed, very long, third toe longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering two-thirds the tympanum, and smaller than that of third finger; a small but distinct inner metatarsal tubercle and a smaller round outer one; a faint tarsal ridge, ending three-fourths of the distance to heel; a heavy skinfold on heel and knee, the heel with a pronounced skin tubercle. Body elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels greatly overlap. Skin of upper parts faintly pustular, with a weak glandular middorsal furrow and minute round dorsal pustules which are a little coarser on the sacrum; venter coarsely granular on posterior two-thirds of belly, on posterior proximal part of femur, and below vent, smooth on chest, finely pustular on throat and chin; a heavy glandular ridge from posterior corner of eye, above tympanum, becoming smaller and ending above shoulder; two or three flat glandular warts at angle of jaw; a slight skinfold across chest; a large ventral disk.

Dimensions.—Head and body, 28 mm.; head length, 11 mm.; head width, 10.5 mm.; femur, 11.5 mm.; tibia, 16 mm.; foot, 13 mm.; hand, 8.5 mm.

Color in alcohol.—Top of head and middorsal area ochraceous; dorsolateral, lateral, and ventral surfaces, soles, and palms immaculate pale cream-buff; a tawny stripe along canthus, the remainder of side of head pale cream-buff.

As this frog has evidently faded considerably, the color of the type (MZUM 50159) as given in its original description (Ruthven, 1917c) follows:

> Above light brown without distinct markings; lower region of sides dull white; sides of head pale brown, this color forming vertical bands with narrow white interspaces beneath the eyes and in front of the eyes displaced by a few white spots on the edge of the jaw and by a vertical white line on the end of the snout; a broad fuscous band extending from the end of the snout along the canthus rostralis to the lateral regions of the breast, and an anal patch of fuscous black; hind limbs and forearms conspicuously cross-banded. Ground color of lower surfaces dull white, the chin, throat, pectoral region, and under surface of hind limbs densely speckled with brown.

Remarks.—With so few specimens known—Ruthven (1922, p. 53) states that three tiny individuals were collected in 1913 and two adults in 1920—it is useless to attempt a summary of variation in critical proportions.

Specimens Examined

COLOMBIA

MAGDALENA: San Lorenzo, MZUM 50160 (paratype), 54573–4.

***Eleutherodactylus bogotensis* (Peters)**

PLATE 56D–F

1863. *Hylodes bogotensis* Peters, 1863a, p. 407 (type locality, vicinity of Santa Fé de Bogotá, [Cundinamarca,] Colombia).—Boulenger, 1882a, p. 215.—Werner, 1899, p. 477.—Cope, 1899, p. 4.—Peracca, 1914, p. 104.—Nieden, 1923, p. 441.

1899. *Hylodes affinis* (part) Werner, p. 478 (type locality, Bogotá, [Cundinamarca,] Colombia.—Nieden (part), 1923, p. 443.—Dunn, 1944a, p. 72.

1916. *Hylodes fasslianus* Werner, p. 303 (type locality, Bogotá, [Cundinamarca,] Colombia.—Dunn, 1944a, p. 71.

1944. *Eleutherodactylus bogotensis.*—Dunn, 1944a, p. 71; 1944c, p. 510.—Stebbins and Hendrickson, 1959, p. 527.—Gorham, 1963, p. 16.

Description.—USNM 118192, an adult female from Bogotá, Cundinamarca, Colombia. No bony ridges on frontoparietal area. Vomerine teeth in two short, heavy, well-separated series behind the choanae; tongue nearly one-half as wide as mouth opening, broadly oval, its posterior border free and slightly notched; snout short, nearly semicircular when viewed from above, rounded in profile, the upper jaw extending slightly beyond the lower; a small conical tubercle on tip of snout and three or four others on upper eyelid; nostrils more lateral than superior, slightly projecting, their distance from end of snout about one-half their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis bluntly rounded; loreal region flat, sloping out to the flaring upper lip. Eye large, prominent, its diameter slightly less than its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum small, its greatest diameter slightly over one-half that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers moderate, with lateral ridges, free, first finger shorter than second, fourth longer than either and reaching to base of disk of third, which covers three-fourths the tympanum; a small oval thumb pad present; a large flat palmar callus; metacarpal tubercles well developed. Toes free, moderate in length, third toe shorter than fifth, the disk of which reaches base of antepenultimate phalanx; disk of fourth toe covering entire tympanum, larger than that of third finger; a large oval inner metatarsal tubercle and a minute outer one; tarsal ridge represented by a short, elongate gland just above inner metatarsal tubercle; a heavy skinfold on heel and knee. Body short, thickset, in postaxillary region slightly narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels just touch. Skin of upper parts finely granular all over, with a somewhat elongated series of glands between the eyes and others in chevron- or X-shapes on back; chin and chest very finely granular; belly coarsely granular, including lower surfaces of femur and area around anus; an irregular glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a slight skinfold across chest, and evidences of a ventral disk in the loose skin along the sides; a transverse external vocal sac in the male.

Dimensions.—Head and body, 31.5 mm.; head length, 10.5 mm.; head width, 12.5 mm.; femur, 12 mm.; tibia, 13.5 mm.; foot, 13 mm.; hand, 9 mm.

Color in alcohol.—Dorsum uniform deep Indian purple; venter dirty buff, the anterior femur and groin pale cream-buff (geranium pink in life); posterior femur immaculate clay color, probably also pink or red in life. Upper lip pale Indian purple without indication of spots.

Remarks.—This little frog is common and apparently gregarious where it occurs. The pink or rose-red sides and concealed limb surfaces, so characteristic of most living individuals, fade quickly to yellowish-tan or grayish-white in preservative. Some have mottled backs, or a narrow middorsal light stripe, or a pair of wider dorsolateral stripes. Adult males usually have the anterior half of the chin slate-colored.

The belly is heavily granular in practically every individual. The adpressed heel reaches between the posterior edge of the tympanum and the posterior corner of the eye in more than 80 percent of the frogs.

In a few it may extend as far as the anterior corner of the eye, and in the remaining ones only as far as the shoulder. The toes may be barely or distinctly webbed at the base, and sometimes with a trace of web between the fourth and fifth toes only. The outline of the snout seen from above may be very slightly pointed, but most often it is blunt and nearly semicircular in outline.

This species seems to be confined to Cundinamarca, where it has been collected by most zoologists visiting the area around Bogotá. One of Werner's two cotypes of *Hylodes affinis* is a young *bogotensis* according to Dunn (1944a, p. 72).

Specimens Examined

COLOMBIA

CUNDINAMARCA: Aguadita, south of Bogotá, ANSP 24340–70, 24372–7; Arrayán, USNM 144690–701, CNHM 81911–2; Bogotá, BM 1919.3.6.33–4; USNM 118192–3, CNHM 7994–5, 10600–1, 26256, ANSP 25059, MCZ 7315-22, 9035, 9743–50, 11614–5, AMNH 13475–6, 24001, 38852, 38859, 38890, 38922, 38925–7, 38935–8, 38941–3; Bogotá region, USNM 127110–3, 146981–6; 16 km. east of Bogotá, USNM 142794–8; Choachí, MCZ 9740–2, AMNH 13464–70; Cruz Verde, páramo, CNHM 81813, USNM 144710–29; east base of Cordillera of Bogotá, at extreme limit of llanos of Bogotá, ANSP 24395; El Boquerón, USNM 123563–5, 144730; Guasca, Río Balcones, CNHM 69740; Gutiérrez, southeast of Bogotá, AMNH 38964, 38968, 38976; Medina, MZUM 71310; Monserrate, USNM 144702–9, 145666–98; [road from] Monserrate to Arrayán, 3,000 m., USNM 150315–44, 144681–9, CNHM 81909–10, 81914; Páramo de Choachí, AMNH 13477; páramo above Bogotá, 14 km. east of Bogotá, USNM 127110–3, 146208–12; Parque Nacional, Bogotá, USNM 144731–6; San Miguel, CNHM 81891; east of Bogotá, USNM 150675–86; Quebrada La Aquadita, Lagunas de Colorodos, Pasca and Usme, USNM 147256–65.

***Eleutherodactylus lehmanni* (Boettger)**

PLATE 53A–C

1892. *Hylodes lehmanni* Boettger, footnote, p. 26 (type locality, Páramo del Bordoncillo, 3,500 m. [Nariño?]).—Mertens, 1922, p. 164.—Nieden, 1923, p. 443.

1963. *Eleutherodactylus lehmanii.*—Gorham, 1963, p. 17.

Description.—USNM 146239, an adult female from west of Pasto, Nariño, Colombia. A large, nearly square, slightly indented fronto-parietal area. Vomerine teeth in two moderately long, slanting, well-separated series behind the choanae; tongue large, two-thirds as wide as mouth opening, cordiform, its posterior border free and notched; snout moderate in length, rounded when viewed from above and in profile, the upper jaw extending somewhat beyond the lower. Nostrils more lateral than dorsal, slightly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis blunt; loreal region slightly concave, sloping outwards to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, considerably greater than interval between the nostrils. Tympanum distinct, its greatest diameter about two-fifths that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers moderately long, with lateral ridges, free, disks of three outer fingers rather large, truncate, first finger much shorter than second, fourth longer than either and reaching nearly to base of disk of third, which covers about two-thirds the tympanum; a distinct oval thumb pad present; a bifurcate palmar callus; metacarpal tubercles well developed. Toes rather short, slightly webbed, third toe much shorter than fifth, the disk of which reaches to base of penultimate phalanx of fourth; disk of fourth toe just covering the tympanum, and larger than that of third finger; a small but distinct oval inner metatarsal tubercle and a less apparent round outer one; a heavy tarsal ridge, ending just before reaching the heel; a heavy skinfold on heel and knee. Body fairly stout, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior border of tympanum; when limbs are laid along the sides, knee and elbow are well separated; when hind legs are bent at right angles to body, heels overlap slightly. Skin of upper parts finely shagreened, with some small granules on the sacrum and larger ones on the sides arranged in incomplete longitudinal rows; belly coarsely granular, chin and chest nearly smooth, lower surface of femur finely granular; a very heavy glandular ridge from posterior corner of eye, above tympanum, ending above shoulder, and some oval glands below it behind tympanum; a heavy skinfold across chest; a slight ventral disk; a large external median vocal sac in the male with characteristic folds (see illustration).

Dimensions.—Head and body, 32 mm.; head length, 10 mm.; head width, 11 mm.; femur, 11.5 mm.; tibia, 13 mm.; foot, 12.5 mm.; hand, 8 mm.

Color in alcohol.—Dorsum chocolate with a narrow middorsal buff line, and three clove brown longitudinal stripes on either side, the outermost dorsolateral in position; sides burnt umber with darker spots covering the heavy glandules; front of groin and rear of axilla immaculate ochre yellow, this tone lightening and blending with the uniform immaculate buff of the venter; side of head sepia, with a darker line below the canthus and another paralleling the edge of the lip; upper leg surfaces walnut brown, with three irregular clove brown crossbands; posterior femur raw sienna, the glandules slightly darker; palms of hands and soles of feet buff below inner digits, becoming drab on outer ones, the disks a little darker.

Remarks.—The type was described as having the snout 1¼ times as long as the diameter of eye, but in USNM 146239 the length of snout and diameter of eye are equal. The inner metatarsal tubercle of the type was said to be small; in most of the series at hand it is well developed and of moderate size. The adpressed heel in this series reaches between the posterior border of the tympanum and the anterior corner of the eye, most frequently to the center of the eye, as in the type. The fingers are free, while the toes show at most a trace of webbing. The belly is finely to coarsely granular in this series; in the type it was weakly granular.

The maximum size in the series of 47 individuals is 37 millimeters; the type measured 33 millimeters. The dorsal pattern of the type as described by Boettger is practically duplicated in several specimens in the series examined, although in some examples the linear stripes break up into spots. In none of the 47 specimens, however, is the belly spotted, as that of the type was said to be. These frogs are nevertheless referred to *lehmanni*, as they are very close to the original description in most other respects.

Specimens Examined

COLOMBIA

Caldas: La Selva, Pueblo Rico, CNHM 54397; Marulanda, north of Manizales, MLS 322–3,

Nariño: Guaitarilla, CNHM 54199, 54315–6, 54318, 54393–6, 54398–411; west of Pasto, USNM 146220–47.

Eleutherodactylus nicefori, new species

Plate 46g–i

Holotype.—USNM 147012, an adult male from Páramo del Almorzadero, Santander, Colombia, collected by Hno. Nicéforo María.

Paratypes.—USNM 147013–5, same data as holotype.

Diagnosis.—Head without heavy bony ridges; frontoparietal region somewhat depressed; vomerine teeth in two small, transverse, nearly contiguous series behind the choanae; tympanum distinct but small, its greatest diameter one-half that of eye; interorbital diameter nearly twice that of upper eyelids; back finely granular; belly corasely granular; digital disks very small; toes slightly webbed; heel reaching to front of shoulder.

Description of holotype.—No bony ridges on top of head; frontoparietal area somewhat depressed. Vomerine teeth in two small, nearly contiguous transverse series behind the choanae; tongue just over one-half as wide as mouth opening, broadly oval, its posterior border free and faintly notched; snout broadly rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, distinctly projecting, their distance from end of snout about two-thirds their distance from eye. Canthus rostralis sharp and distinct; loreal region slightly concave, sloping outwards to the upper lip. Eye relatively small but prominent, its diameter three-quarters its distance from tip of snout; interorbital area plane, its diameter nearly twice that of upper eyelid and considerably greater than interval between nostrils. Tympanum distinct but small, its greatest diameter one-half that of eye, separated from eye by an interval equal to its own diameter. Fingers moderately long, with very small disks, without lateral ridges, free, first finger shorter than second, fourth longer than either and reaching to base of disk of third, which covers about one-fourth the tympanum; an oval thumb pad present; a cordiform palmar callus; metacarpal tubercles well developed. Toes rather short and also with small disks, webbed slightly, third toe a little shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering one-fourth the tympanum, and about the same size as that of third finger; a rather flat oval inner metatarsal tubercle and a smaller round outer one; an ill-defined tarsal ridge, ending halfway to heel; a prominent skinfold on heel and knee. Body stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to front of shoulder; when limbs are laid along the sides, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels fail to meet. Skin of upper parts finely granular, with an interrupted middorsal row of glands, and three rows of similar glands on each side, the outer one dorsolateral in position; a prominent ( )-shaped gland behind the occiput; small tubercles on top of head and arms, larger ones on upper leg surfaces; venter coarsely granular excepting the chin, which is faintly granular; a round flat gland, somewhat larger than the other granules, in postaxillary region; a glandular ridge from posterior corner of eye above tympanum, thickening greatly and ending above shoulder in two heavy glands; a distinct skinfold across chest; a ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 21.5 mm.; head length, 7.5 mm.; head width, 8.5 mm.; femur, 7.5 mm.; tibia, 8 mm.; foot, 7.5 mm.; hand, 6 mm.

Color in alcohol.—Dorsum burnt umber to vandyke brown, with the bases of the longitudinal glands and larger tubercles outlined with clove brown; side of head wood brown, with a large indistinct russet spot in front of and behind the eye extending to edge of upper lip; canthal region faintly suffused with sepia; upper limb surfaces vandyke brown, except knees, elbows, and upper parts of feet and hands, which are wood brown; side of body wood brown with many small clove brown spots becoming larger in groin and also in axilla, where the dark color centers around the large postaxillary gland; venter cinnamon, the belly with many scattered sepia dots; palms of hands and soles of feet wood brown, the subarticular tubercles and disks lighter.

Variations.—The largest paratype (USNM 147013), probably a female, is 25.5 millimeters in head-and-body length. It has a light wood brown spot inside the ( )-shaped postoccipital ridges, an indistinct lighter band across the sacrum, and two or three indistinct diagonal dark bars on the upper surfaces of the limbs. The chin has a few dark spots like those on the belly. The other two paratypes are not fully grown. Their backs are russet. One has a narrow light middorsal line, and the dark edges of the bordering glands are confluent into a pair of wavy longitudinal lines. The sides of the body are sepia, with a dark area more or less apparent around the postaxillary gland in all specimens.

Remarks.—This new frog seems to be most closely related to *Eleutherodactylus curtipes* (Boulenger) from Intac, Ecuador. It differs from that species in having a larger tympanum, a smaller eye, and the vomerine teeth more transverse. The length of its snout is 1⅓ times the diameter of eye, and the diameter of its tympanum is one-half the diameter of eye. The large postaxillary gland of this new species does not seem to occur in *curtipes*. The similarities are more striking than the differences, however, for both species are wide-headed and small-eyed, while their narrow digital disks, heavy bodies, and short legs give them an appearance different from most other members of the genus. With only four known examples, variation cannot be satisfactorily studied at present.

This new species is named for its collector, Hno. Nicéforo María, who, having spent almost a half century studying the natural history of Colombia, may well be called the "dean of Colombian herpetologists."

Eleutherodactylus elegans (Peters)

PLATE 56G–I

1863. *Liuperus elegans* Peters, 1863b, p. 447 (type locality, Bogotá [Cundinamarca].—Boulenger, 1887, p. 298.

1914. *Hylodes fuhrmanni* Peracca, p. 104 (type locality, Páramo de Cruz Verde, 3,000–3,600 m., east of Bogotá [Cundinamarca]).

1944. *Eleutherodactylus elegans*.—Dunn, 1944c. p. 510.—Stebbins and Hendrickson, 1959, p. 528.—Gorham, 1963, p. 17.

Description.—USNM 144776, an adult from Monserrate, Bogotá, Cundinamarca, Colombia, collected at 2,800 meters. No bony ridges on top of head; frontoparietal area slightly depressed. Vomerine teeth in two widely separated, small slanting series behind the choanae;

tongue three-fourths as wide as mouth opening, cordiform, its posterior border free and notched; snout moderate, rounded when viewed from above, its tip truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about two-thirds their distance from eye. Canthus rostralis heavy but blunt; loreal region concave, flaring outwards to the upper lip. Eye large, prominent, its diameter about four-fifths its distance from tip of snout; interorbital diameter 1½ times the diameter of upper eyelid, equal to interval between nostrils. Tympanum distinct, at least anteriorly, its greatest diameter one-half that of eye, separated from eye by an interval nearly equal to its own diameter. Fingers long, rather slender, with lateral ridges, free, first finger a trifle shorter than second, fourth longer than either, reaching to base of disk of third, which covers nearly one-half the tympanum; an oval thumb pad present; palmar callus not distinct; metacarpal tubercles well developed. Toes moderately long, webbed at the base, third toe shorter than fifth, its disk reaching almost to penultimate phalanx of fourth; disk of fourth toe covering two-thirds of the tympanum and larger than that of third finger; a weak oval inner metatarsal tubercle and a very small, indistinct outer one; no tarsal ridge; a skinfold and a few small tubercles on heel; a skinfold on knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of tympanum; when limbs are laid along the sides, knee and elbow just touch; when hind legs are bent at right angles to body, heels are slightly separated. Skin of upper parts smooth (pustular under the lens), with granules on sides and around anus; venter heavily granular on belly and lower femur, smooth on chin and chest; a very heavy glandular ridge from posterior corner of eye above tympanum, ending in a swollen parotoid-like area above and behind ears; a slight skinfold across chest; a ventral disk; apparently external lateral vocal sacs in the male.

Dimensions.—Head and body, 43.5 mm.; head length, 14.5 mm.; head width, 18 mm.; femur, 18.5 mm.; tibia, 20 mm.; foot, 20.5 mm.; hand, 15 mm.

Color in alcohol.—Dorsum russet, with coarse seal brown marblings appearing to begin at the midline and extending backwards and outwards in very crude chevrons; sometimes a clove brown diagonal line or spot accompanying the marbled pattern; a fine clove brown median line on top of snout; limbs wood brown, with narrow sepia crossbars on upper surfaces; posterior femur ochraceous-buff with two or three large white spots (in line with the wood brown areas of upper femur); venter pinkish buff, immaculate, except for some indistinct darker suffusions on chin and around lower jaw; soles of feet and palms of hands cream buff, the disks pale sepia; side of head ochraceous-buff, with an indistinct sepia marbling on upper lip and a wider sepia stripe below canthus.

Remarks.—In all but one of the 18 specimens at hand, the adpressed heel reaches a point between the posterior border of the eye and the shoulder; in the exception the heel reaches the center of the eye. The toes in all examples are plainly webbed at the base. A slight heel appendage may be discerned in some, but most have only a few blunt tubercles or rugosities on the heel. While some of the frogs are very dark, so that the pattern is not distinct, others are paler brown, with the elaborate dark marblings very apparent. The venter is heavily spotted with brown in most individuals, but in a few the spotting is much reduced, or confined to the posterior part of the body. The wide toad-like head and the swollen parotoid region allow one to recognize the species fairly easily.

Specimens Examined

COLOMBIA

CUNDINAMARCA: Aguadita, south of Bogotá, ANSP 24378–82; Bogotá region, USNM 146980; Chipaque, MLS 159; east side of Bogotá on mountain slope, MLS 294; Laguna Chisacá, Páramo del Hata, 20–30 km. south of Bogotá, USNM 142799; Laguna de Los Colorados between Pasca and Usme, headwaters of Aguadita, USNM 147255; La Mesa, San Javier, 1,000–1,100 m., USNM 144775; vicinity of Monserrate, near Bogotá, USNM 145706 (at 3,000 m.), 144776–9 (at 2,800–3,000 m.), CHNM 81868–9.

Eleutherodactylus sanctae-martae Ruthven

PLATE 55A–C

1917. *Eleutherodactylus sanctae-martae* Ruthven, 1917c, p. 1, pl. 1, fig. 3 (type locality, Santa Marta Mountains [Magdalena]); 1922, p. 53.—Barbour and Loveridge, 1929, p. 263.—Gorham, 1963, p. 18.

Description.—MZUM 54541, an adult male from San Lorenzo, Magdalena, Colombia. No bony ridges on top of head; frontoparietal area depressed. Vomerine teeth in two transverse, short, narrowly separated series behind the choanae; tongue large, three-fourths as wide as mouth opening, squarish, its posterior border free and very slightly indented; snout fairly long, ovate when viewed from above, rounded in profile, the upper jaw extending well beyond the lower, which is truncate in front. Nostrils dorsolateral, projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis strong; loreal region flat, the upper lip flaring out below it. Eye large, prominent, its diameter about five-sixths its distance from tip of snout; interorbital diameter equal to that of upper eyelid and also to interval between nostrils. Tympanum small but very distinct, its greatest diameter about two-fifths that of eye, separated from eye by an interval equal to its own diameter. Fingers quite long, with lateral ridges, free, first finger with a very small disk and much shorter than second, fourth longer than either and reaching to base of disk of third, which covers tympanum and extends beyond for almost one-fourth the width of tympanum; a long cylindrical thumb pad present; a nearly divided palmar callus, its outer part not very distinct; metacarpal tubercles well developed. Toes moderately long, distinctly webbed at base, third and fifth toes subequal, their disks reaching to base of antepenultimate phalanx of fourth toe; disk of fourth toe covering two-thirds the tympanum, and much smaller than that of third finger; a rather flat, cylindrical inner metatarsal tubercle and a much smaller round one; a strong tarsal ridge, ending two-thirds the distance to heel; a distinct skinfold on heel and knee, and a prominent tubercle on heel. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to nostrils; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap somewhat. Skin of back and sides very finely granular, of head and upper limb surfaces smooth; a few small tubercles on sacrum, on upper eyelids, and on a faint glandular line between the eyes, and a large tubercle at side of back just above axilla; a weak glandular W behind the head; belly and lower and posterior surfaces of femur coarsely granular; chin and chest nearly smooth; throat pustular; a narrow glandular ridge from posterior corner of eye above tympanum, ending behind it; a distinct skinfold across chest; a prominent ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 47 mm.; head length, 17 mm.; head width, 16.5 mm.; femur, 21 mm.; tibia, 25 mm.; foot, 20 mm.; hand, 15 mm.

Color in alcohol.—Dorsum cinnamon, with an indistinct darker W behind the head, and with a dark spot emphasizing the large tubercle on back above axilla; side of body pale wood brown; a seal brown lateral stripe beginning on canthus, darkening above tympanum, continuing on shoulder, becoming lighter and dropping diagonally across the side to belly; a few dusky spots in front of groin; side of head below canthal stripe drab to fawn color, with a few indistinct darker patches below eye; upper surface of femur wood brown, with three narrow, light-margined sepia crossbars which fade out on anterior surface of femur but darken and enlarge to cover the posterior surface, enclosing a few circular light spots representing the light margins of the crossbars on upper part of femur; tibia, foot, and forearm with traces of dark crossbars; soles of feet and palms of hands clay color, their disks and tubercles lighter.

Remarks.—While the 15 frogs examined do not give a complete picture of the variability of *E. sanctae-martae,* the six critical proportions fall within the same range of significance as those of *E. erythropleurus,* to which it is allied in other characters, such as the granular belly, finely granular back, the presence of a heel tubercle (or at least a ridge across the heel), and in having the adpressed heel reach between the center of the eye and the tip of the snout. It differs from *erythropleurus* in having much larger finger disks and a smaller tympanum that is situated at a greater distance from the eye.

The toes are definitly webbed at the base in all but one of the specimens examined, and that one has a mere trace of a web. Usually the belly is coarsely granular, but it is nearly smooth in one example. In some frogs the glandular W behind the head is more distinct in outline and color than in the one described. Two of the frogs show continuous dark lateral stripes below the dorsolateral folds, and in these the center of the back is paler.

Specimens Examined

COLOMBIA

MAGDALENA: Cincinnati, MZUM 54542; San Lorenzo, MCZ 8972–3 (paratypes), USNM 118732 (paratype), MZUM 54541, 54545, CAS 54737 (paratype); San Miguel, MZUM 54544; Finca La Granja, on road to San Lorenzo, USNM 150881–5.

TOLIMA: MZUM 56435a–b.

Eleutherodactylus affinis (Werner)

PLATE 55G–I

1899. *Hylodes affinis* Werner (part), p. 478 (type locality, road between La Unión and Chingasa [Cundinamarca], Colombia).—Nieden (part), 1923, p. 443.—Dunn, 1944a, p. 72.

Description.—ZIMUG 67/— (the designated lectotype), an adult collected on the road between La Unión and Chingasa, at 1,000–2,400 meters, in Cundinamarca, Colombia. No bony ridges on top of head. A large shield-shaped frontoparietal depression. Vomerine teeth in two small, narrowly separated, slanting series behind the choanae; tongue broad, two-thirds as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout moderately long, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, scarcely projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis sharp; loreal region flat, flaring outwards to the upper lip. Eye large, prominent, its diameter a little less than its distance from tip of snout; interorbital diameter nearly twice that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter not quite one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers rather long, with lateral ridges, free, first finger much shorter than second, fourth longer than either and reaching to base of disk of third, which is a little larger than the tympanum; a distinct oval thumb pad present; a larger, bilobed palmar callus; metacarpal tubercles well developed. Toes moderately long, not webbed (or with barely a trace of web), third toe much shorter than fifth, the disk of which reaches base of antepenultimate phalanx of fourth; disk of fourth toe a little larger than tympanum and equal to that of third finger; a rather small oval inner metatarsal tubercle and a minute, scarcely distinguishable outer one; a tarsal ridge ending midway to heel; a distinct skinfold on heel and knee. Body rather stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts finely granular, with some coarser granules on sides and sacrum; venter coarsely granular except for throat and chin, which are nearly smooth; a low glandular ridge from posterior corner of eye above tympanum, ending above corner of mouth; a distinct skinfold across chest; a faint ventral disk; apparently external lateral vocal sacs in the male.

Dimensions.—Head and body, 28 mm.; head length, 10 mm.; head width, 11 mm.; femur, 12.5 mm.; tibia, 14 mm.; foot, 12 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum smoke gray, with a wide sepia)–(-shaped band across the shoulders, its anterior prolongations extending to posterior border of eye and its posterior ones continued as a diagonal lateral stripe across the side, fading out there; an indistinct drab crossbar between the eyes, and a drab stripe along canthus; upper lip smoke gray with two sepia spots from lower eyelid to upper lip; a narrow sepia line following ridge above and behind tympanum; lumbar and sacral regions indistinctly mottled with drab; three wide sepia crossbars on tibia, continued less distinctly over femur and foot; an indistinct dark triangular postanal patch; posterior femur drab-gray with a few darker spots; venter hair brown, immaculate except for some small sepia spots around edges of lower jaw and on chest; soles of feet and palms of hands immaculate hair brown.

Remarks.—Dr. P. Kuenzer very kindly loaned to us Werner's syntypes of *Hylodes affinis*, which are still in good condition. The smaller syntype, from the Páramo de Bogotá, was taken on the road to Choachi on January 27, 1897, by Dr. Otto Bürger; actually, it is an immature frog of the species *E. bogotensis*, as Dr. Dunn has stated (1944a, p. 72). Its adpressed heel reaches only to the center of the eye, and its critical measurements lie well within those of numerous other examples of *bogotensis* at hand. The lectotype differs from the smaller syntype, and the two obviously are not of the same species. The name *affinis* is retained for the lectotype and other examples. The lectotype has a large frontoparietal depression, and in this respect is similar to *lehmanni*. Its legs are longer than those of *bogotensis*, as its adpressed heel reaches between the eye and the nostril, while in *bogotensis* the heel seldom extends farther than the center of the eye and often only to the tympanum. The color patterns also are quite unlike, as *affinis* has large dark squarish dorsal spots prolonged on the side (at least in the lectotype) as oblique dark lines, while *bogotensis* usually has a conspicuous pale (crimson in life) area on the side and on the front of the femur. The largest example of *affinis* at hand (CNHM 81882) measures 31.5 millimeters, while the largest specimen of *bogotensis* is 35 millimeters in length. The greatest difference between the two species seems to be the lack of a perceptible frontoparietal depression in the latter, although the frontoparietal area is hollowed out a little, as in most eleutherodactyli of this group.

Two specimens, USNM 118727–8 (formerly MZUM 63777) from Magdalena, were identified at the Museum of Zoology, University of Michigan, as *affinis*, They have the frontoparietal depression but the bodies appear more elongate and the toe disks a little larger than in typical *affinis*. No color pattern is now apparent.

Specimen CNHM 54412 is quite similar in bodily proportions to the lectotype but differs in several respects. It has a dark brown venter with large light round spots all over the belly and the throat is somewhat lighter. Its heel reaches only to the center of the eye. Its tympanum is distinct but is much smaller (only about one-fourth the diameter of the eye) than that of the lectotype. Its venter is nearly smooth, although some very weak granulations across the chest are discernible. It has a similar dorsal pattern, that of a wide W across the shoulders, but it has two or three light diagonal curving lateral stripes not noticeable in the lectotype.

One of the Medina examples, MLS 84, has a wide white middorsal stripe, and the shoulder markings are reduced to a pair of slanting brown spots marking the glands.

Specimens Examined

COLOMBIA

Amazonas: Leticia, MLS 59.

Boyacá: Sutatenza, MLS 408.

Cauca: Quintana, near Popayán, CNHM 54412.

Cundinamarca: Road between La Unión and Chingasa, 1,000–2,400 m., ZIMUG 67/— (lectotype); near Bogotá, BM 1919.3.6.33-4; Abayo, Tequendama, CNHM 81879–83; Medina, MLS 84, 84a.

Magdalena: La Cumbres, Santa Marta Mountains, USNM 118727–8; west side of Sierra Madre de Santa Marta, MCZ 17576.

VAUPÉS: Alto Río Cuduyarí, CNHM 82009–11.

Eleutherodactylus latidiscus latidiscus (Boulenger)

PLATE 55D–F

1898. *Hylodes latidiscus* Boulenger, 1898a, p. 121, pl. 15, fig. 4 (type locality, Cachabé, Ecuador).—Nieden, 1923, p. 451, fig. 325.

1933. *Eleutherodactylus latidiscus*.—Dunn, 1933, p. 68.—Parker, 1934c, p. 267.—Breder, 1946, p. 405.—Taylor, 1952, p. 710.—Cochran, 1955, p. 222.—Goin, 1959a, p. 135.—Gorham, 1963, p. 17.

Description.—BM 98.4.28.109 (paratype), an adult from Cachabé, Ecuador. No bony ridges on top of head but a heavy conical tubercle between the eyes and a smaller pair between their anterior borders; a distinct diamond-shaped frontoparietal depression. Vomerine teeth in two very heavy, transverse, triangular, well-separated series behind the choanae; tongue two-thirds as wide as mouth opening, broadly ovate, its posterior border free and distinctly notched; snout moderately rounded when viewed from above and in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, faintly projecting, their distance from end of snout one-third their distance from eye. Canthus rostralis blunt but heavy; loreal region concave, flaring outwards to the upper lip. Eye large, prominent, its diameter four-fifths its distance from tip of snout; interorbital diameter equal to that of upper eyelid, a little greater than interval between nostrils. Tympanum small, not very distinct, its greatest diameter one-fifth that of eye, separated from eye by an interval equal to 1½ times its own diameter. Fingers long, with lateral ridges, faintly webbed, first finger much shorter than second, fourth longer than either and reaching to base of disk of third, which is three times the diameter of the tympanum; a small but projecting oval thumb pad present; a flat, bifid palmar callus; metacarpal tubercles well developed. Toes long, slightly webbed, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe nearly three times the diameter of tympanum and almost as large as disk of third finger; a small but prominent inner metatarsal tubercle; outer metatarsal tubercle absent, or indicated only by a small wart; a short distinct tarsal ridge, ending one-third the way to heel; a heavy skinfold on heel beset with a few short tubercles; a heavy skinfold on knee. Body rather stout, in postaxillary region less than greatest width of head. When hind leg is adpressed, heel reaches to a point just beyond anterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels touch. Skin of upper parts rough, especially above shoulders and on sacrum; snout tubercular; several conical warts on upper eyelid and a very large wart between eyes; a faint dorsolateral fold; upper limb surfaces fairly smooth; sides of body finely granular; venter nearly smooth on chin and chest, finely granular and wrinkled transversely on belly, granular on lower femur; a very heavy glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a ridge along upper jaw, becoming more pronounced below eye; a short heavy fold in front of shoulder; three skinfolds along sides of body from above shoulder nearly to groin; a pronounced skinfold across chest; a distinct ventral disk; a pair of external vocal sacs in the male.

Dimensions.—Head and body, 52 mm.; head length, 19 mm.; head width, 20.5 mm.; femur, 21.5 mm.; tibia, 23 mm.; foot, 21 mm.; hand, 14 mm.

Color in alcohol.—Dorsum seal brown, with the numerous glands and tubercles raw umber; sides pale wood brown, with some narrow dark and light diagonal lines on the posterior half to groin, and a few scattered dark spots behind axilla; venter broccoli brown, the chin with an irregular border of sepia marks separated by a short pale line; throat and chest faintly dotted with sepia, belly heavily so; legs with four wide, light-edged, clove brown crossbands, arms with two less-apparent bands; posterior femur drab with a fine clove brown vermiculation; sides of head clove brown with two light-edged sepia spots below eye; palms of hands and soles of feet drab, their disks and tubercles lighter.

Remarks.—The leg is quite variable in length, as the adpressed heel falls from the center of the tympanum to the tip of the snout, although it reaches between the posterior and the anterior border of the eye in 66 percent of the frogs examined. The toes are distinctly webbed at the base in about 70 percent and are very faintly webbed in the remainder. A single strong tubercle is present on the heel of about 10 percent of the frogs, and in an equal number a flattened ridge or skinfold occurs; in the great majority the heel has one or several rather small tubercles or granules.

Specimens CNHM 44119, 54312–3, and 54413 from Quintana, Cauca, and USNM 152264 and 151270 from Puracé, Cauca, resemble the paratype BM 98.4.28.109 in essentials, as they have extremely large disks on the third and fourth fingers, the same heavy canthus with deeply concave loreal flaring almost horizontally toward the upper lip, at least a trace of glandular dorsolateral ridges, and the same diagonal lateral stripes and (usually) light-bordered crossbands on the legs. But a great difference in development of the tubercles on the head and body is apparent, as the interorbital tubercle, so obvious in the paratype, may be represented by a small transverse ridge between the eyes, or that area may be nearly smooth. The tympanum is sometimes as large as the disk of the third finger (a sexual characteristic?), but the supratympanic ridge is always heavily developed. The postoccipital depression may or may not be readily visible—in highly tuberculate frogs it is not easily seen. A wide, light, sharp-edged middorsal band occurs sometimes with almost no other dorsal pattern. The belly is distinctly spotted in all the Cauca frogs.

Some frogs from 40 kilometers east of Manizales, Caldas (MLS 318–320), have a lateral network of dark lines on a light ground instead of diagonal stripes as in the paratype, the Cauca frogs, and in a frog (MLS 182c) from San Pedro, Antioquia.

Three small frogs (USNM 151985–7) from Páramo del Ruiz on the boundary between Cauca and Valle seem to be young *latidiscus* because of the wide disks of fingers and toes, the disk of third finger being one and one-half times the diameter of the tympanum; however, the snout seems a little more pointed. More material is needed in order to make positive identification.

E. R. Dunn has identified specimens from Panama as being of this species.

Specimens Examined

COLOMBIA

Antioquia: Angelópolis, MLS 167; Jericó, MCZ 24896–7; Medellín, AMNH 1344, 38768, 38774, 38830–1, 38833; Medellín Valley, AMNH 38784, 38787; Sampedro (or San Pedro), north of Medellín, AMNH 38757, 38759–60, 38763–4, CNHM 30565–6, MCZ 24909; Urrao, Santa Barbara, CNHM 69718, 69743; 9 km. south of Valdivia, CNHM 63853; Quebrada Valdivia, CNHM 63858; Yarumal, CNHM 63851–2, 63855, 63859, 63873, 82013.

Caldas: Montañita, MLS 365, 372, 398; Santa Rosa de Aso, AMNH 38817.

Cauca: Quintana, near Popayán, CNHM 44088; near Moscopán, USNM 146421.

Santander: El Centro, CNMH 81762.

Tolima: Quindío Mountains, MCZ 8220–3.

Valle: Cisneros, CNHM 44069, 44101; La Victoria, MLS 174.

ECUADOR: Cachabé, BM 98.4.28.109 (paratype).

PANAMA: Chiriquí: Boquete, UMMZ 61093–4, 61095a–b; Cerro Bruja, USNM 54022–3; Pirri Range, near head of Río Limón, USMM 50207; Porto Bello, USNM 45573.

Eleutherodactylus latidiscus tamsitti, new subspecies

Figure 44

Holotype.—CNHM 69735, an adult from near San Adolfo, 1,400 meters, on the Río Suaza, Acevedo, Huila, Colombia, collected by P. Hershkovitz.

Diagnosis.—Differs from *Eleutherodactylus latidiscus* (Boulenger) in having longer toes and fingers and a larger inner metatarsal tubercle; in having the vomerine teeth closer together and nearer the choanae;

in having a more distinct tympanum; in lacking a pointed tubercle between the eyes; and in having three or four dorsal chevrons.

Description of holotype.—No bony ridges on top of head; frontoparietal area slightly depressed. Vomerine teeth in two short, slanting, narrowly separated series behind the choanae; tongue large, three-quarters as wide as mouth opening, its posterior border free and scarcely notched; snout broadly rounded when viewed from above, nearly truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils dorsolateral, distinctly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis rounded; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter four-fifths its distance from tip of snout; interorbital diameter equal to that of upper eyelid and equal to interval between nostrils. Tympanum small but distinct, its greatest

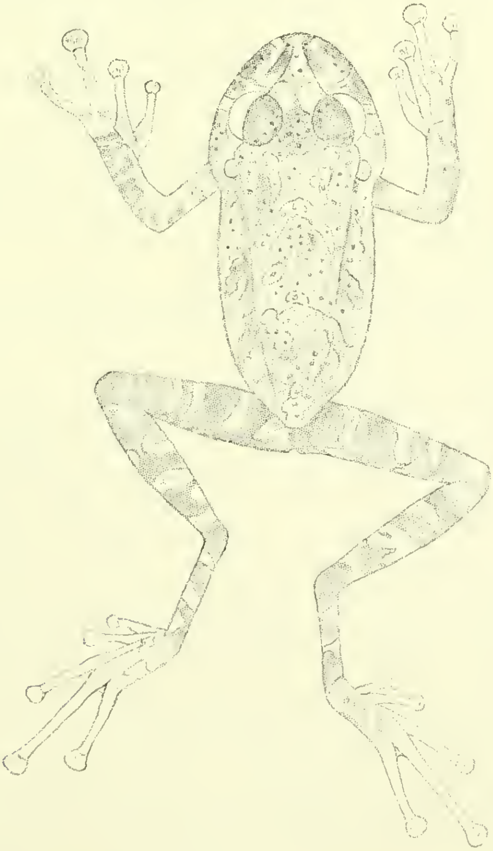

FIGURE 44.—*Eleutherodactylus latidiscus tamsitti*, holotype, CNHM 69735 (same size).

diameter one-fourth that of eye, separated from eye by an interval equal to 1½ times its own diameter. Fingers long, the two outer ones with very large truncate disks, with lateral ridges, free, first finger much shorter than second, fourth longer than either, reaching to base of disk of third, which covers an area twice that of tympanum; a thick semilunar thumb pad present; no true palmar callus but three small flat granules instead; metacarpal tubercles well developed. Toes long, slightly webbed, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering 1½ times the area of tympanum and a little smaller than disk of third finger; a small knob-like inner metatarsal tubercle, and a minute granule in place of an outer one; a short but heavy tarsal ridge, ending one-fourth the distance to the heel; a heavy skinfold on heel and knee. Body elongate, in postaxillary region much narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts covered with small pustules or granules which are largest on sacrum above shoulders and on upper eyelids; venter and lower surface of femur finely granular, the chest and throat less so; a short, heavy glandular ridge from posterior corner of eye above tympanum, ending behind tympanum, and a pair of heavy)(-shaped ridges from posterior eye to shoulder; a heavy skinfold across the chest; no ventral disk.

Dimensions.—Head and body, 55.5 mm.; head length, 20.5 mm.; head width, 22 mm.; femur, 27 mm.; tibia, 28.5 mm.; foot, 27.5 mm.; hand, 18.5 mm.

Color in alcohol.—Dorsum ecru drab, with a wide seal brown bar between the eyes, with three or four brown chevron-shaped bars from above the shoulders to the sacrum, the last bar poorly defined; venter cream buff, with large light drab reticulations from chest over entire abdomen and lower surfaces of limbs; sides of body pale olive buff with a few large irregular seal brown spots; upper surfaces of legs with four or five wide brown crossbars continued onto the concealed surfaces as dark reticulations; posterior femur dark with small light spots; throat olive buff with a few pearl gray dots; side of head cream buff with a darker area along the canthus and loreal region, and two indistinct dark spots under the eye; palms of hands and soles of feet olive buff, the tubercles and disks a little paler; groin and axilla dark brown. All dorsal tubercles emphasized with a small clove brown dot.

Remarks.—The British Museum very kindly loaned to us a cotype (BM 98.4.28.109, from Cachabé, Ecuador) of *Hylodes latidiscus* Boulenger, and when this cotype was compared with the above-described specimen the similarities of the two frogs were apparent at once. The head contour, rough skin, and enormous digital disks are nearly identical. But the Huila frog has much longer toes and fingers; its inner metatarsal tubercle is larger; its vomerine teeth are closer together and nearer to the choanae; its tympanum seems to be more distinct; and it has no high, pointed tubercle between the eyes. In color pattern, the Colombian frog has two large irregular light spots on the lower proximal tibia, and the chest and belly are covered with a coarse gray reticulation; in the cotype of *latidiscus* there are no light spots on the lower tibia, and the chest and belly are finely speckled with dots that give a pepper-and-salt effect. Both specimens have the frontoparietal area slightly sunken, with a more pronounced depression on the snout level with the anterior corners of the eyes.

The holotype is the only example of this subspecies known at present.

We take pleasure in naming this form in honor of Dr. J. R. Tamsitt, whose Colombian collections have extended our knowledge considerably.

Eleutherodactylus carmelitae Ruthven

PLATE 53D–F

1922. *Eleutherodactylus carmelitae* Ruthven, p. 51, pl. 11, fig. 1, pl. 12, fig. 1 (type locality, Quebrada Viernes Santo, 5,000 ft., San Lorenzo, Santa Marta Mountains [Magdalena,] Colombia.—Gorham, 1963, p. 17.

Description.—MCZ 8979, an adult from Santa Marta Mountains, Magdalena, Colombia. No bony ridges on top of head; a distinct frontoparietal depression. Vomerine teeth in two short, heavy, narrowly separated series behind the choanae; tongue two-thirds as wide as mouth opening, cordiform, its posterior border free and slightly notched; snout short, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower, which is nearly truncate in front. Nostrils superolateral, slightly projecting, their distance from end of snout three-fourths their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis short but distinct; loreal region concave, slanting out to joint the flaring upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter equal to that of upper eyelid, slightly less than the interval between the nostrils. Tympanum small, distinct in this specimen, its greatest diameter one-third that of eye, separated from eye by an interval slightly greater than its own diameter. Fingers long, with lateral ridges, free, first finger much shorter than second, second and fourth subequal, disks large, truncate, disk of third finger more than covering the tympanum; a distinct elongate thumb pad and a thick palmar callus present; metacarpal tubercles distinct. Toes free, long, third toe a trifle longer than fifth, disks of toes smaller than those of fingers, disk of fourth toe barely covering the tympanum; a small oval inner metatarsal tubercle and a minute round outer one; no tarsal ridge; a slight skinfold on heel and knee. Body stout, in postaxillary region much narrower than greatest width of head. When hind leg is adpressed, heel reaches to nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Dorsum anteriorly coarsely pustular, with heavy W- and Λ-shaped glands on back and some unpaired large tubercles on snout and sacral region; posterior part of back, sides, and postanal region coarsely granular; venter, including chin and chest, finely granular; a coarse glandular ridge from posterior corner of eye above tympanum, ending above shoulder, with two coarse tubercles below tympanum; a slight skinfold across chest; perhaps a weak ventral disk.

Dimensions.—Head and body, 32 mm.; head length, 12 mm.; head width, 12.5 mm.; femur, 15.5 mm.; tibia, 17.5 mm.; foot, 16.5 mm.; hand, 10.5 mm.

Color in alcohol.—Dorsum dull chocolate, with a triangular seal brown patch between the eyes; the large tubercles on snout and the W- and Λ-shaped rows of glands on back outlined with seal brown; femur and tibia with alternating wide and narrow dark crossbars (three of each) on a drab ground; venter pale wood brown, with coarse drab reticulations on chest, belly, and lower leg surface; sides of body also vermiculated with dark and light markings; posterior femur nearly immaculate wood brown; anterior femur with extensions of the suprafemoral crossbars; side of head drab, with a dark triangular spot in front of eye on upper lip and another squarish spot beneath eye; palms of hands and soles of feet pale wood brown.

Notes on color of freshly collected examples (USNM 150762–79, 150998–151023).—Belly light drab-gray to pale olive buff, with dark to smoke gray dots and suffusions on lower limbs, especially near knees. Throat and chest mouse-gray, plumbeous or slate with many small round dots of the ground color showing through. Soles and palms slate to drab, the disks a little lighter. Back blackish slate to middle gray, head and occiput with a lighter W of light gray to pearl gray (one juvenile, 150774, has touches of geranium pink on eyelids and along sides); other irregular dark markings on back; a wide light middorsal stripe in three examples; a black stripe from snout along canthus, and narrowed behind eye over tympanum; two wide and two narrow dark spots from eye to upper lip; no light line along upper lip; three wide slate bars on upper leg surfaces separated by pale drab or gray areas; posterior femur drab gray below, merging into dark crossbars with reticulated slate and white spots; sides similarly spotted.

Remarks.—In the series at hand, the heel may reach the nostril, the tip of the snout, or well beyond the tip of the snout. No heel tubercle is present, although sometimes a small ridge occupies its usual position. The femur, tibia, and foot seem to be significantly longer in *E. carmelitae* than in the other Colombian eleutherodactyli having granular bellies, with the exception of *E. megalops.* The belly may be finely to weakly granular, transversely ridged, or nearly smooth in the smaller examples. The toes have no definite webs. The very small tympanum appears to be sunken in most adults.

Specimen MZUM 54530 (presumably a paratype of *carmelitae* from San Lorenzo, Magdalena) has a smooth belly and back, longer legs, somewhat smaller disks, and other features not in agreement with the described specimen (MCZ 8979).

Specimens Examined

COLOMBIA

MAGDALENA: Cincinnati, MZUM 51110; Quebrada de la Dante, MZUM 25432–4 (paratypes); Quebrada Viernes Santo, MZUM 54527 (paratype); Río Frío, MCZ 16071–2; San Lorenzo, MZUM 54530 (paratype); Santa Marta Mountains, MCZ 8979; Finca La Granja, USNM 150762–79, 150998–151023.

***Eleutherodactylus taeniatus* (Boulenger)**

PLATE 46A–C

1912. *Hylodes taeniatus* Boulenger, p. 188 (type locality, Noananoa [Noanama], Río San Juan, Chocó, Colombia).—Nieden, 1923, p. 441.
1963. *Eleutherodactylus taeniatus.*—Gorham, 1963, p. 18.

No fresh examples identifiable as *E. taeniatus* have been received, but since it may be a valid form the original description and recent photographs of the type are included here.

Boulenger (1912, p. 188) described the type as follows:

> Tongue oval, nicked behind. Vomerine teeth in two oblique oval groups behind the level of the choanae. Snout rounded, as long as orbit, with strong, nearly straight canthus and oblique, concave loreal region; nostril near the tip of the snout; interorbital space as broad as the upper eyelid; tympanum distinct, one-third the diameter of the eye. Fingers and toes rather short, the tips dilated into large, broad disks; first finger not extending as far as second; a slight rudiment of web between the toes; subarticular tubercles well developed; a small oval inner and a very small rounded outer metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout; tibia nearly two-thirds the length of head and body. Skin smooth, the belly very indistinctly granulate. Brown above, darker on the sides; a blackish, light-edged streak on each side of the back, from the eye to above the groin, gradually converging towards its fellow; a dark brown streak, with a fine median line (light), from the tip of the snout to the sacral region; a dark streak from the upper eyelid to the scapular region; a canthal streak and two

bars below the eye blackish; limbs with oblique dark cross-bands, heel whitish; white beneath, throat speckled with brown.

From snout to vent 27 mm.

A single specimen from Noananoa, Rio San Juan, Choco, S.W. Colombia, from the collection of Mr. M. G. Palmer.

The holotype is now BM 1909.10.30.41.

***Eleutherodactylus insignitus* Ruthven**

PLATE 57D–F

1917. *Eleutherodactylus insignitus* Ruthven, 1917a, p. 1, pl. 1 (type locality, heights east of San Miguel, Santa Marta Mountains, [Magdalena]); 1922, p. 51.—Barbour and Loveridge, 1929, p. 260.—Gorham, 1963, p. 17.

Description.—MZUM 48402 (paratype), an adult female from heights east of San Miguel, 6,000–7,000 feet, Santa Marta Mountains, Magdalena, Colombia. No bony ridges on top of head; a slight frontoparietal depression. Vomerine teeth in two transverse, heavy, narrowly separated series behind the choanae; tongue three-fifths as wide as mouth opening, thick, cordiform, its posterior border free and slightly notched; snout broadly rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis blunt; loreal region weakly concave, flaring to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter a trifle less than that of upper eyelid, equal to interval between nostrils. Tympanum small but distinct, its greatest diameter one-third that of eye, separated from eye by an interval equal to its own diameter. Fingers fairly long, with lateral ridges, free, first finger shorter than second, fourth longer than either, reaching halfway on penultimate phalanx of third, the disk of which covers almost one-half the tympanum; a distinct oval thumb pad present; a small bifid palmar callus; metacarpal tubercles well developed. Toes long, with traces of a web, third toe longer than fifth, its disk reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering about two-thirds the tympanum and definitely larger than that of third finger; a pronounced oval inner metatarsal tubercle and a smaller round one; no true tarsal ridge; a heavy skinfold on heel and knee. Body rather stout, in postaxillary region a little wider than greatest width of head. When hind leg is adpressed, heel reaches anterior border of eye; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts smooth (pustular under the lens), with short glandular ridges behind eyes and on the side; venter faintly granular posteriorly and below anus, smooth on chin, chest, and anterior part of belly; a heavy glandular ridge from posterior corner of eye about tympanum, ending above the shoulder; a slight skinfold across the chest; traces of a ventral disk; probably a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 54.5 mm.; head length, 18.5 mm.; head width, 20 mm.; femur, 24.5 mm.; tibia, 26.5 mm.; foot, 25.5 mm.; hand, 13.5 mm.

Color in alcohol.—Dorsum seal brown, with a slightly darker >< covering the characteristic glands from inner posterior corner of eye toward center of back, and ending at a level with the axilla; a pair of indistinct dark spots on inner borders of upper eyelids; a black lateral line beginning on tip of snout, bordering the canthus rostralis and continuing above and behind the tympanum to end just above shoulder; upper surfaces of limbs with very faint dark crossbars; sides of body cinnamon, with a fine clove brown network in axilla, nearly disappearing on anterior half of side, then becoming thicker and darker with relatively few light spots in front of groin and on anterior proximal part of femur; posterior femur and belly clove brown with many minute light dots; anterior distal femur and inside of tibia dark with light vertical bars; venter wood brown with small gray dots thickly scattered on chest and belly, less thickly on throat; edge of lower jaw with two or three indistinct gray blotches; side of head seal brown, the area below and behind nostril and in front of tympanum a little lighter; lower limb surfaces dull wood brown heavily sprinkled with sepia dots; soles of feet and palms of hands sepia, the disks and tubercles lighter.

Remarks.—Because of its marbled side, dark-dotted throat, fairly long legs, general proportions, and large size, this species suggests *E. w-nigrum*, just as Dunn (1944a) suspected, although its usually granular underparts and slight frontoparietal depression indicate its alliance with frogs of Group II.

The adpressed heel reaches the anterior border of the eye in four of the five examples at hand and to the nostril in the remaining one. The belly may be smooth, or very faintly granular posteriorly. Above, the five paratypes are nearly identical in pattern with the figure of the type specimen given in Ruthven's original description. The smallest frog has a much darker venter, the entire belly being clove brown with some light spots; two larger specimens are nearly immaculate below, the small dots occurring only at sides of chest, throat, and belly.

Specimens Examined

COLOMBIA

Magdalena: Heights east of San Miguel, 6,000–7,000 ft. MZUM 43397–8, 48402–3, 48407 (all paratypes).

Eleutherodactylus cruentus (Peters)

PLATE 53G–I

1873. *Hylodes cruentus* Peters, 1873b, p. 609 (type locality, Chiriquí, Panama).—Brocchi, 1881, p. 54.—Boulenger, 1882a, p. 216.—Ruthven, 1915c, p. 1, pl. 1.—Nieden, 1923, p. 438.
1963. *Eleutherodactylus cruentus*.—Gorham, 1963, p. 17.

Description.—USNM 146991, an adult from Tequendama Falls, Cundinamarca, Colombia. No bony ridges on top of head; a distinct frontoparietal depression. Vomerine teeth in two very weak, well-separated patches behind the choanae; tongue two-thirds the width of mouth opening, squarish, with a slight notch on its free posterior border; snout moderately long, pointed at the tip when seen from above, more rounded in profile, the upper jaw projecting considerably beyond the lower, which is nearly truncate anteriorly; nostrils superolateral, their distance from end of snout two-thirds their distance from eye. Canthus rostralis thick and rounded, with a heavy furrow between it and the flat loreal region which merges with the flaring upper lip. Eye large and prominent, its diameter about three-fourths the snout length; interorbital diameter 1½ times the width of upper eyelid and 1¼ times the interval between nostrils. Tympanum distinct, its diameter about two-fifths that of eye, and separated from eye by about one-fourth its own diameter. Fingers moderate, free, with very wide lateral ridges, first finger much shorter than second, which in turn is shorter than fourth, tip of fourth finger reaches to base of penultimate phalanx of third; disk of third finger covering four-fifths of tympanum; a small crescentic pad at base of first finger; two or three small, weak pads on palm of hand; metacarpal tubercles well developed; toes long, free, with wide lateral ridges, third toe much shorter than fifth, which reaches almost to base of penultimate phalanx of fourth; toe disks a little larger than finger disks, disk of fourth toe completely covering the tympanum; a small round inner and a very small outer metatarsal tubercle; a prominent tarsal ridge extending nearly to heel. Body moderate, in postaxillary region narrower than the relatively wide head. When hind leg is adpressed, heel reaches to nostril; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body heels greatly overlap. A short supratympanic ridge, fading out above the shoulder. A narrow glandular median dorsal line from tip of snout to anus. Skin above minutely pustular, with small scattered tubercles on snout, a group of several heavy tubercles above shoulder, and similar but less prominent ones on each side of sacrum; a group of small, pointed tubercles in area behind tympanum and on each eyelid; chin faintly tubercular, chest and belly and posterior femur heavily so; the presence of a ventral disk indicated by a fold of skin across the chest, and some extremely loose skin along sides from axilla to groin, outer border of foot serrated or tubercular, and one or more tubercles on heel. Loose skin folds in front of shoulder may indicate external vocal sacs in the male.

Dimensions.—Head and body, 24 mm.; head length, 9.5 mm.; head width, 9 mm.; femur, 11 mm.; tibia, 12.5 mm.; foot, 11 mm.; hand, 7 mm.

Color in alcohol.—Dorsum cinnamon brown; a wide clove brown stripe beginning at tip of snout, continuing along canthus and above tympanum, and widening on the sides, becoming less distinct, then fading out half-way to groin; upper lip dark russet brown, unspotted; legs with two or three dark diagonal bars; venter russet to drab, immaculate; a dark postanal patch.

Remarks.—The adpressed heel extends between the center of the eye and the nostril in over 80 percent of the examples at hand. In the remainder the heel reaches the snout tip or, rarely, a little beyond. The heel usually has a glandular ridge, or from one to several small tubercles, with an occasional frog having from one to three larger and more distinct heel tubercles. The toes are webbed at the base in all examples seen, although the webbing is often very slight. Sometimes a small tubercle appears at the tip of the snout, and frequently several such tubercles occur on the upper eyelid. Usually a V- or W-shaped gland emphasized with dark outlines may be seen between the shoulders in adults; in young frogs the glands may appear in the shape of a flattened hexagon. Dorsolateral folds are present in CNHM 69729–30.

Some examples are much darker than the specimen described here, and little of their dorsal patterns can be discerned. The sides may be heavily spotted or streaked with black, usually concentrated in the groin and often extended onto the anterior femur. In most of the pale examples the venter is immaculate, but in darker individuals the belly is often heavily suffused with small slate-colored dots and spots, especially on throat and chest. The soles and palms are also slate in the darker frogs, but the disks are a much lighter gray.

Specimens Examined

COLOMBIA

ANTIOQUIA: Andes, AMNH 14078, 14091–3, 14095, 14097, 14105, 14109–11, 14115, 14117, 14120, 14125–6, 14128–9, 14134, 14147 (in poor condition); Angelópolis, AMNH 14108, 14012, 38791, 38826 (juv., in poor condition); Caicedo, CNHM 69729–30, 69733–4; Jericó, MCZ 24894; Medellín, AMNH 38831, 38838, 38890, 39959, 39963, MLS 166, 166a-b; Sampedro (=San Pedro), AMNH 38758, 38762, MCZ 24901–2, MLS 401; Santa Rita Creek, AMNH 1360 (unusual color); Santa Rosa, AMNH 39456, 39458; Sonsón, MLS 180, 180a; AMNH 39329, 39332, 39334, 39338, 39391–2; Urrao, Santa Barbara, CNHM 69728; 9 km. south of Valdivia, CNHM 63854.

Boyacá: Peligro on Ramiriquí-Rondón Road, MLS 419, USNM 150652–5; Sutatenza, MLS 229, 284, 407–8, USNM 146967–8.

Caldas: La Selva, Pueblo Rico, CNHM 54329, 54331, 54358; Santa Cecilia, Pueblo Rico, MZUM 54333; Montañita, MLS 367, USNM 150671–2; Las Cruces (Marulanda), MLS 370–1, USNM 150656; San Felix, MLS 361, 373, USNM 150673–4.

Caquetá: Florencia, MLS 289; La Providencia, MLS 56.

Cauca: Near Moscopán, USNM 146421; Quintana, near Popayán, USNM 147247–8.

Chocó: Upper Río Pepé, tributary of Río Baudó, USNM 144790.

Cundinamarca: Medina, MLS 84; north of Albán, MLS 388–9; Sasaima, USNM 146987–90; Tequendama Falls, USNM 146991–4.

Magdalena: Santa Marta Mountains, MCZ 3897, 8970–1, 6081–2, CAS 54779–81; Finca La Granja, road to San Lorenzo, 2,300–2,700 m., USNM 150880.

Norte de Santander: La Selva, MLS 218, 218a, 219, 224; above Pamplona, MLS 152.

Santander: El Centro, CNHM 81762.

Tolima: Quindío Mountains, CNHM 7983.

Valle: Virology Field Station, Río Raposo, USNM 151454.

PANAMA: Barro Colorado Island, MCZ 24221, MZUM 69510a–c, 101794, USNM 118198, 118670; Corozal, MZUM 98422; La Loma, USNM 139899.

Eleutherodactylus erythropleurus (Boulenger)

Plate 56a–c

1896. *Hylodes erythropleura* Boulenger, p. 20 (type locality, Cali, [Valle,] 970 m.).—Nieden, 1923, p. 442.

1963. *Eleutherodactylus erythropleurus.*—Gorham, 1963, p. 17

Description.—USNM 146969, an adult male from La Selva, Caldas. No bony ridges on top of head; frontoparietal area slightly depressed. Vomerine teeth in two triangular, nearly contiguous, transverse series behind the choanae; tongue large, four-fifths as wide as mouth opening, broadly cordate, its posterior border free and deeply notched; snout rather long, rounded when viewed from above, nearly truncate in profile, the upper jaw projecting somewhat beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis distinct; loreal region flat, flaring outwards to the upper lip. Eye large, prominent, its diameter about four-fifths its distance from tip of snout; interorbital diameter a trifle greater than that of upper eyelid, equal to interval between nostrils. Tympanum very distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers long, with wide lateral ridges, very faintly webbed at the base, first finger much shorter than second, fourth longer than either, its disk reaching almost to base of disk of third, which covers nearly one-half the tympanum; a large crescentic thumb pad present; a flat palmar callus; metacarpal tubercles moderately developed. Toes long, very slightly webbed, third toe much shorter than fifth, the disk of which reaches halfway on antepenultimate phalanx of fourth; disk of fourth toe covering about one-third the tympanum, smaller than that of third finger; a strong oval inner metatarsal tubercle and a smaller outer one; a weak tarsal ridge, ending midway to heel; a heavy skinfold on heel and knee. A slight glandular swelling on flank above groin. Body elongate, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow are well separated; when hind legs are bent at right angles to body, heels greatly overlap. Skin of upper parts minutely pustular, with a few small granules on sacrum; sides of body minutely granular; venter and lower surface of femur coarsely granular; chest and chin nearly smooth; a heavy glandular ridge from posterior corner of eye above tympanum and ending behind it; a distinct skinfold across the chest; a ventral disk; a pair of lateral internal vocal sacs in the male, visible externally as a pair of wrinkles on each side of chin.

Dimensions.—Head and body, 34 mm.; head length, 12.5 mm.; head width, 12 mm.; femur, 14.5 mm.; tibia, 16.5 mm.; foot,13.5 mm.; hand, 10 mm.

Color in alcohol.—Dorsum Mars brown, darkening to seal brown on upper part of snout, and with some small, dark suffusions in lumbar region; venter fawn color, immaculate; sides of body ecru drab, with a clove brown stripe from posterior corner of eye, ending in a large dark spot behind tympanum; sides of head fawn color, the canthus with a seal brown stripe, and a few indistinct darker spots along upper lip; anterior and posterior femur drab, immaculate; upper surface of legs drab, with faint indications of two or three brown crossbars; soles of feet and palms of hands fawn color, their disks slightly darker; a round gland-like swelling in front of and above groin marked with darker brown.

Remarks.—In the series of 39 adults from La Selva, the dorsal color in alcohol is usually slate-gray. Sometimes a darker middorsal stripe appears, and, rarely, three or five narrow ones. The snout is occasionally immaculate pearl gray, and sometimes a dark interocular band occurs behind this light area. The venter may give a pepper-and-salt effect of small gray dots thickly scattered on a pale ground. The carmine or pink, when still visible, is concentrated in the groin, extending often halfway to the axilla, and on the anterior femur in a single large patch extending about two-thirds the distance to the knee. The posterior femur and the inner tibia are largely pink, this color sometimes breaking up into two or three medium-sized spots on the posterior femur, but usually in one large patch covering the entire inner surface of the tibia, with a smaller spot on the upper tarsus. The upper femoral surface has a wide longitudinal gray band separating the two pink areas in front and behind, while the posterior part of the belly is also pink.

The adpressed heel reaches the anterior corner of the eye in about 45 percent of these frogs; between the eye and the nostril in 34 percent; to the nostril in 8 percent; to the tip of the snout in 5 percent; and to the center of the eye in 5 percent. The toes may lack webs or, at most, have only slight traces of webs. A heel tubercle, present in most specimens, ranges in size from a quite obvious, medium-sized, pointed structure down to a series of several small ones; sometimes it is a mere ridge across the heel.

Specimens Examined

COLOMBIA

ANTIOQUIA: Jericó, MCZ 24895; Sonsón, AMNH 39327–8, 39330–7, 39340–2

CALDAS: Laguneta, ANSP 25402; La Selva, Pueblo Rico, CNHM 54636, 54640–2, 54644, 54646–56, 54663, 54667, 54670, 54672–3, 54676–7, 54679, 54681, 54683, 54685, 54687–9, 54697–8, 54700, 54705, USNM 146969–70, 147233–9; Pueblo Rico, 5,200 ft., BM 1910.7.11.59–60; Santa Rosa de Aso, AMNH 38818.

CAUCA: Río San Juan, USNM 147240–4; Quintana, near Popayán, CNHM 54414.

Eleutherodactylus vertebralis (Boulenger)

PLATE 59D–I

1886. *Hylodes vertebralis* Boulenger, 1886b, p. 415 (type locality, Intac, Ecuador).—Werner, 1901, p. 600.—Peracca, 1904, p. 26.—Nieden, 1923, p. 451.

1934. *Eleutherodactylus latidiscus* (not of Boulenger).—Parker, 1934c, p. 267.

1938. *Eleutherodactylus vertebralis*.—Parker, p. 440.—Gorham, 1963, p. 18.

Description.—BM 78.1.25.15 (syntype), an adult female from Intac, Ecuador. A pair of parallel, very slightly developed bony ridges on top of head; frontoparietal area distinctly sunken. Vomerine teeth in two small, widely separated, slanting series behind the choanae; tongue one-half as wide as mouth opening, oval, its posterior border free and unnotched; snout moderately long, slightly acuminate when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsal, distinctly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis distinct; loreal region very concave, flaring sharply outwards to the upper lip. Eye large, prominent, its diameter three-fourths its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, much greater than interval between nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to its own diameter. Fingers rather long, with prominent lateral ridges, free, first finger much shorter than second, fourth longer than either, reaching halfway on penultimate phalanx of third, the disk of which covers the tympanum; a small oval thumb pad present; a small double palmar callus; metacarpal tubercles well developed. Toes moderately long, faintly webbed, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering three-fourths the tympanum, and a little smaller than that of third finger; a small oval inner metatarsal tubercle and a smaller rounded outer one; a distinct tarsal ridge, ending near heel; a heavy skinfold on heel and knee. Body rather stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles of body, heels overlap. Skin of upper parts pustular, with some very small granules from behind eye along dorsolateral regions; a faint dorsolateral fold; sides finely to coarsely granular except in axilla and groin; chin and chest smooth, belly coarsely granular; finer granules around venter and on posterior femur; a heavy glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a skinfold across the chest; traces of a ventral disk.

Dimensions.—Head and body, 36 mm.; head length, 12.5 mm.; head width, 13.5 mm.; femur, 15 mm.; tibia, 17 mm.; foot, 16.5 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum uniform seal brown except for a wide middorsal stripe from tip of snout to anus, ecru drab anteriorly to vinaceous-cinnamon posteriorly; sides of body as well as anterior femur cinnamon with a fine seal brown vermiculation becoming more dense dorsally; posterior femur marbled with dark and light; sides of head seal brown, the edge of the lip fawn color; venter ochraceous with a few small scattered sepia spots on throat, chest and sides of belly; palms of hands and soles of feet clay color, the disks and tubercles drab, the outer digits darker.

Remarks.—E. vertebralis may be grouped either with those species having a sunken postoccipital area or with those having longitudinal bony head ridges, since both features occur in this interesting frog. It is actually more similar in appearance to *latidiscus,* which has the depressed postoccipital region and no head ridges, than it is to *cornutus,* which has heavy ridges; for this reason it is keyed near to *latidiscus.*

A syntype of *vertebralis* was compared directly with a paratype of the other large-disked frog, *latidiscus.* Both have a faint dorsolateral fold. The vomerine teeth are small and slanting in *vertebralis* but are heavy and transverse in *latidiscus.* The interorbital diameter is 1½ times that of the upper eyelid in the former, and equal to it in the latter. The tympanum in *latidiscus* is small, being only one-fifth the eye diameter, but in *vertebralis* it is one-half the eye diameter. While some of these proportions vary in the large series of *vertebralis* at hand, there can be no doubt that this species is distinct from *latidiscus*.

In many young specimens of *vertebralis* from Colombia the head ridges are scarcely raised above the skin, but the interorbital area beneath the transparent skin appears bony or granular. This area extends well behind the level of the eyes in an elongated shield shape, and it is sometimes bordered posteriorly by a curved ridge. More material from the known localities is needed to ascertain the degree of development in the head ridges. The presence of faint dorsolateral folds distinguishes *vertebralis* from most other Colombian species of *Eleutherodactylus*. Many examples have a single heavy tubercle above the shoulder. The pattern is varied, some being dark above with a darker W between the shoulders and a light-spotted middorsal area which in a few examples becomes the wide sharp stripe that gives the species its name. The sides are mottled with dark brown, often with light diagonal lines or irregular patches becoming more definite in front of the groin. The belly may be pale and unspotted, or with small dark spots and reticulations, or with light spots on a black background.

Specimens Examined

COLOMBIA

Antioquia: Angelópolis, MLS 167; Jericó, MCZ 24896–7; Medellín, AMNH 38830–1, 38833; Medellín Valley, AMNH 38784, 38787; Sampedro, north of Medellín, CNHM 63861–70, 30566, AMNH 38757, 38759, 38763–4, USNM 118191, 147245–6, 146966, 150647–8, MCZ 24903–8, MLS 350; Urrao, Páramo Frontino, CNHM 69719–20; Ventanas, 50 km. northwest of Yarumal, USNM 150647–8, 150651.

Boyacá: Páramo Vijogual, 20 km. north of Pajarito, USNM 151871–2; Peligro on Ramiriquí-Rondón road, USNM 150652–5.

Caldas: La Selva, Pueblo Rico, CNHM 55329, 54331, 54358; 19–20 km. south-southeast of Manizales, 2,700–2,860 m., USNM 146363–5; 40 km. east of Manizales, MLS 318a–b, 320; Montañita, USNM 150671–2; San Felix, MLS 366 (2).

Cauca: Three km. south of Popayán, 1,800 m., USNM 151278–9 (juv.); one-half km. north of Puracé, USNM 151183–263, 151267–70, 151938–9; Quintana, near Popayán, CNHM 43999, 44116, 44118–20, 44124–5, 54327, 54312–3, 54413, USNM 147247–7.

Huila: San Adolfo, Acevedo, CNHM 69737.

Magdalena: Finca La Granja, road to San Lorenzo, 2,300–2,700 m., USNM 150873–7.

Putumayo: Santiago, CAS 85157.

Tolima: Out of Manizales on old road to Nevada de Ruiz, USNM 151504–5, 151977–80; Quindío Mountains, CNHM 7893.

ECUADOR: Intac, BM 78.1.25.15 (syntype).

Eleutherodactylus frater (Werner)

PLATE 54A–C

1899. *Hylodes frater* Werner, p. 479 (type locality, Peperital, 1,000 m., near Villavicencio [Meta]).—Nieden, 1923, p. 442.
1963. *Eleutherodactylus frater*.—Gorham, 1963, p. 17.

Description.—ZIMUG 67/235 (holotype), an adult from Peperital, near Villavicencio, Meta, Colombia. No bony ridges on top of head; frontoparietal area faintly depressed. Vomerine teeth in two very weakly developed slanting series behind the choanae; tongue two-thirds as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout broad, rounded when viewed from above and in profile, the upper jaw extending slightly beyond the lower. Nostrils dorsolateral, projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis curving, not very distinct; loreal region faintly concave, sloping outwards to the upper lip. Eye large, prominent, its diameter about four-fifths its distance from tip of snout; interorbital diameter 1¼ times that of upper eyelid, a little greater than interval between nostrils. Tympanum small but distinct, its greatest diameter one-third that of eye, separated from eye by an interval equal to its own diameter. Fingers fairly long, with weak lateral ridges, free, first finger a little shorter than second, fourth longer than either, reaching nearly to base of disk of third, which covers three-fourths the tympanum; a prominent oval thumb pad present; a weak, flat palmar callus; metacarpal tubercles well developed. Toes moderately long, indistinctly webbed at the base, third toe much shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe covering the tympanum, and a little larger than that of third finger; a small oval inner metatarsal tubercle and an indistinct smaller outer one; a weak inner tarsal ridge, ending near the knee; a heavy skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the side, knee and elbow barely touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts pustular, with larger granules and glands above the shoulder, on top of head, and on sacrum; venter finely granular, the chin and chest smooth; a thin, sharp glandular ridge from posterior corner of eye above tympanum, ending behind corner of mouth; a heavy skinfold across chest; a ventral disk; an external vocal sac in the male.

Dimensions.—Head and body, 21.5 mm.; head length, 7.5 mm.; head width, 8 mm.; femur, 8.5 mm.; tibia, 10.5 mm.; foot, 8 mm.; hand, 5.5 mm.

Color in alcohol.—Dorsum drab-gray, with a faint sepia crossbar between the eyes followed by a squarish wood brown spot extending to shoulders; a paler and larger brown spot across the lumbar region, and a small, more-indistinct one on the sacrum; a pair of prominent narrow clove brown) (-shaped marks behind the eyes; a pair of semilunar sepia spots at tip of snout; a pale russet spot on canthus and two diagonal ones from lower eyelid to lip border; supratympanic ridge outlined with clove brown; upper hind limb surfaces with two or three faint sepia crossbars; an indistinct dark postanal patch; knee with a sepia spot; posterior femur and tibia pale drab with indistinct continuation of the sepia crossbars; side of head drab-gray with darker spots as mentioned above; venter smoke gray and completely covered with minute brown dots; palms of hands and soles of feet dull cream buff, dotted except on the subdigital tubercles; sides of body light drab-gray darkening towards the belly; a group of small sepia spots on glands above armpit and a similar group above groin.

Remarks.—The type closely resembles USNM 144790 from a tributory of Río Baudó on the upper Río Pepé, Chocó, and USNM 146963–5 from Medellín, Antioquia.

Although Werner in his original description likens *frater* to *unistrigatus* Günther, it appears to be quite similar to Boulenger's *ockendeni.* The most apparent differences are as follows:

Character	*frater*	*ockendeni*
Tongue	Deeply notched.	Entire, or indistincly notched.
Diameter of eye	Four-fifths of snout length.	Equal to snout length.
Interorbital diameter	1¼ times width of upper eyelid.	Hardly as broad as upper eyelid.
Tympanum	Small but distinct.	Indistinct.

[The above was written before the receipt of a paratype of *ockendeni* kindly loaned by the British Museum. The similarities of the two type specimens in color are very apparent, as the dark spots below the eye and the dark postanal patch are nearly identical in both. But the dark > < shaped marks behind the eyes in *frater* do not appear in *ockendeni,* while several structural features separate them, as already outlined.]

The very large, folded, external vocal pouch in the male of this species suggests its alliance with the *gularis* group. Its vomerine teeth are very weak (indeed, sometimes nonexistent) and they are slanting and widely separated. The tongue is very wide and long, seeming too large for the small creature's mouth. The snout is not long, but since its sides are straight it gives the impression of being acuminate.

The skin is often very tubercular, especially on the snout, upper eyelids, and shoulders, while the rest of the back sometimes has a good sprinkling of tubercles. The > < shaped glands behind the head are usually apparent; in one example (USNM 146965) the lower halves of the chevrons are continued backwards as a heavily glandular dorsolateral line.

The belly is very heavily granular and the throat is smooth in all examples at hand. The heel may reach only to the posterior corner of eye or to just beyond the snout. The toes usually have no webs, but traces of webs are visible in one or two specimens.

Specimens Examined

COLOMBIA

ANTIOQUIA: Medellín, USNM 146963–5; San Pedro, MLS 351.
CHOCÓ: Upper Río Pepé, tributary of Río Baudó, USNM 144790.
CUNDINAMARCA: Sasaima, USNM 146987–90.
META: Peperital, near Villavicencio, 1,000 m., ZIMUG 67/235 (type).

***Eleutherodactylus megalops* Ruthven**

PLATE 52D–F

1917. *Eleutherodactylus megalops* Ruthven, 1917b, p. 3, pl. 1, fig. 3 (type locality, Santa Marta Mountains [Magdalena]); 1922, p. 52.—Gorham, 1963, p. 17.

Description.—MZUM 54486, an adult male from San Lorenzo, Magdalena, Colombia. No bony ridges on top of head; frontoparietal area somewhat sunken. Vomerine teeth in two short, heavy, transverse, narrowly separated series behind the choanae; tongue large, three-fourths as wide as mouth opening, broadly cordiform, its posterior border free and notched; snout moderately rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils lateral, slightly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis distinct; loreal region slightly concave, flaring outwards to the upper lip. Eye large, prominent, its diameter four-fifths its distance from end of snout; interorbital diameter equal to that of upper eyelid, a little less than interval between nostrils. Tympanum small but distinct, its greatest diameter one-fourth that of eye, separated from eye by an interval equal to 1⅓ times its own diameter. Fingers rather short, with lateral ridges, free, first finger a little shorter than second, fourth longer than either and reaching halfway on penultimate phalanx of third, which covers three-fourths the tympanum; disks of first and second fingers small; a crescentic oval thumb pad present; a distinct semidivided palmar callus; metacarpal tubercles well developed. Toes fairly long, very faintly webbed, third and fifth subequal, their disks reaching to base of antepenultimate phalanx of fourth toe; disk of fourth toe covering three-fourths the tympanum, and about the same size as that of third finger; a small but prominent inner metatarsal tubercle and a minute, round outer one; a short, faint tarsal ridge, ending not far behind inner metatarsal tubercle; a distinct skinfold on heel and knee, with a few small tubercles on the heel. Body moderately stout, in postaxillary region almost as wide as greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels touch. Skin of upper parts minutely granular to pustular; a few weak, diagonal glandular ridges above shoulders and on back, and a very faint middorsal line; belly finely granular, throat and chin smooth; a weak glandular ridge from posterior corner of eye above tympanum, ending above and behind tympanum; a slight skinfold across the chest; a ventral disk; a median external vocal sac in the male.

Dimensions.—Head and body, 34.5 mm.; head length, 13.5 mm.; head width, 13 mm.; femur, 15.5 mm.; tibia, 17 mm.; foot, 14 mm.; hand, 9.5 mm.

Color in alcohol.—Dorsum sepia anteriorly to wood brown posteriorly, with some small clove brown spots above the axilla and groin; side of body pale wood brown to pinkish buff, with small sepia dots irregularly scattered from behind axilla to front of groin; venter buff to pinkish buff, the chin, chest and anterior half of belly with many small sepia spots; upper limb surfaces ecru drab to fawn color, with traces of three indistinct darker crossbars on legs and one such crossbar on forearm; anterior surface of femur pinkish buff, with a row of clove brown spots which become larger towards the knee; posterior femur drab with barely an indication of darker marbling; side of head ecru drab, with two or three rhomboidal dark spots below eye; canthus with a slightly darker line below it; upper lip edged with five or six wide dark spots, and corresponding but paler spots along lower lip; palms of hands and soles of feet ecru drab suffused with faint dusky dots, the disks and tubercles paler.

Color notes taken on freshly collected specimens (USNM 150796–872).—Belly pale olive buff to pearl gray, most examples with drab to clove brown dots and reticulations on chin, chest, and belly, but some with paler spots anteriorly; a few almost without spots, and others with the chin heavily spotted, a light narrow longitudinal line dividing this area. Back drab gray to mouse gray or slate, often with geranium pink to vinaceous pink suffusions remaining on sides, sacrum, and upper limb surfaces. Three frogs have a sharp pearl-gray rhomb over eyes and occiput; one has a long, light, triangular mark from the eyes, narrowing to the anus; seven have wide or narrow light middorsal stripes. All have a narrow dark stripe from tip of snout, along canthus, and above tympanum, ending behind it; two large dark spots from eye to lip, usually crossed by a narrow white line paralleling the lip. Palms and soles mouse gray, the disks and tubercles lighter.

Remarks.—A characteristic found in *megalops* is the presence of a tubercle (or sometimes of several small tubercles) on the heel, and rarely with a ridge or swelling across it. The skin of the belly is granular to faintly granular in 60 percent of the specimens examined and smooth to pustular (under the lens) in the remainder. The back often shows several short glandular ridges, while some of the larger frogs have tubercles more or less thickly scattered on the back.

While the toes were said to be free in the original description, in several specimens at hand (including a paratype, USNM 64026 from San Lorenzo) the toes are faintly webbed. The throat, chest, and anterior half of belly are usually brown-spotted, the rest of the belly being immaculate, in this respect agreeing with *longirostris.*

Specimens Examined

COLOMBIA

CUNDINAMARCA: Chamega, MCZ 19223, 19952–5.

MAGDALENA: Cincinnati, MCZ 4755–6; Río Frío, MCZ 16070; San Lorenzo, USNM 64026 (paratype), MZUM 54475, 54479, 54485–6, 54490–2, CAS 54735, 54784–6; Santa Marta Mountains, MCZ 8981–2; Sierra Nevada de Santa Marta, MCZ 15643–4, 16073–5, 19962–3; Finca La Granja, USNM 150796–872, 150879.

***Eleutherodactylus lehmanvalenciae* Thornton**

PLATE 58A–C

1965. *Eleutherodactylus lehmanvalenciae* Thornton, p. 425, fig. 1 (type locality approximately five miles upstream from mouth of Raposo River and 20 miles south of Buenaventura, Department of Valle, Colombia).

Description.—USNM 151399 (holotype), an adult female collected approximately five miles upstream from mouth of Río Raposo and 20 miles south of Buenaventura, Valle, Colombia. No bony ridges on top of head. Vomerine teeth in two small, slanting, nearly contiguous series well back of the choanae; tongue one-half as wide as mouth opening, broadly cordiform, its posterior border free and faintly notched; snout broadly rounded when viewed from above, truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils more lateral than dorsal, projecting, their distance from end of snout barely one-fourth their distance from eye. Canthus rostralis distinct, concave; loreal region nearly flat, sloping outwards to the upper lip. Eye large, prominent, its diameter equal to its distance from nostril;

interorbital diameter 1¼ times that of upper eyelid, a little greater than interval between nostrils. Tympanum small but distinct, its greatest diameter one-third that of eye, separated from eye by an interval equal to its own diameter. Fingers moderately long, disk of first finger relatively small, all with lateral ridges, free, first finger shorter than second, fourth longer than either and reaching nearly to base of disk of third, which is twice the size of the tympanum; a crescentic thumb pad present; a bilobed palmar callus; metacarpal tubercles well developed. Toes scarcely webbed, moderately long, third toe shorter than fifth, the disk of which reaches to base of antepenultimate phalanx of fourth; disk of fourth toe three times the size of the tympanum and larger than that of third finger; some of the toe and finger disks slightly pointed; a small, flattened inner metatarsal tubercle and a smaller rounded outer one; no tarsal ridge; a heavy skinfold on heel and knee. Body rather elongate, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and slbow are slightly separated; when hind legs are bent at right angles to body, heels greatly overlap. Skin smooth on head and anterior half of back, very faintly pustular on the sacrum; venter finely granular, the granules on center of throat very minute; a narrow glandular ridge from posterior corner of eye above tympanum, ending in a long dorsolateral skinfold from eye, above shoulder, and nearly to groin; no skinfold across chest; a prominent ventral disk; a gular disk appearing as ( )-shaped skinfolds below the chin, and serving as a vocal sac in the male.

Dimensions.—Head and body, 22.5 mm.; head length, 8.5 mm.; head width, 8.5 mm.; femur, 9.5 mm.; tibia, 12 mm.; foot, 8 mm.; hand, 6.5 mm.

Color in alcohol.—Head, sides, and back very pale vinaceous-buff, with a narrow transverse clove brown bar between the eyes, and a less-regular bar across the snout just in front of eyes; a wide brown canthal stripe from nostril to eye, lighter and narrower above tympanum, and continuing a little way along the dorsolateral skinfold; top of femur covered with minute dots of pale wood brown lightening on anterior and posterior surfaces, and similarly covering upper tibia, foot, and arm. Margin of upper lip pale buff, with a suffusion of minute drab dots below the dark canthal stripe; venter immaculate pale cream buff, the lower surface of foot and hand with pale drab suffusions.

Remarks.—The paratype (USNM 151401) is like the holotype in color except that the disks of toes and fingers are accented with darker brown below, the tubercles beneath the toes are ringed with brown, and there is a suffusion of russet spots across the snout in front of the eyes instead of a dark transverse broken bar in that area.

Specimens Examined

COLOMBIA

Valle: Five miles upstream from mouth of Río Raposo, USNM 151399 (holotype), USNM 151401 (paratype).

Eleutherodactylus diastema (Cope)

Plate 58g–i

1876. *Lithodytes diastema* Cope, p. 155 (type locality, Camp Mary Caretta [= Margheretta], Panama); 1886, p. 274.
1882. *Hylodes diastema.*—Boulenger, 1882, p. 212.—Günther, 1901, p. 238.
1946. *Eleutherodactylus diastema.*—Breder, 1946, p. 405.

Description.—USNM 147232, an adult female from Pizarro, Chocó, Colombia. No bony ridges on top of head. Vomerine teeth in two long, widely separated, slanting series behind the choanae; tongue slightly more than half as wide as mouth opening, oval, its posterior border free and unnotched; snout short, bluntly rounded when viewed from above, nearly truncate in profile, the upper jaw extending somewhat beyond the lower, which is truncate anteriorly. Nostrils superolateral, slightly projecting, their distance from end of snout about two-thirds their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis rounded; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum very small, its greatest diameter one-third that of eye, separated from eye by an interval equal to its own diameter. Fingers short, without lateral ridges, free, second and fourth fingers subequal, first finger much shorter than either; disks of fingers large, that of third finger about twice the tympanic area; a small oval thumb pad present; a very small palmar callus; metacarpal tubercles weak, scarcely visible. Toes with barely perceptible traces of webs, short, third toe shorter than fifth, the disk of fifth reaching to base of penultimate phalanx of fourth; disks of toes a little larger than those of fingers, disk of fourth toe covering more than twice the tympanic area; a small, blunt, oval outer metatarsal tubercle and a round inner one of about the same size; no tarsal ridge; a heavy skinfold on heel and knee. Body rather elongate, in postaxillary region slightly narrower than greatest width of head. When hind leg is adpressed, heel reaches to center of eye; when limbs are laid along the sides, heel and elbow are separated; when hind legs are bent at right angles to body, heels are well separated. Skin of upper parts smooth except for some very small tubercles on snout; venter smooth except for a granular area around vent and on lower femur; a weak glandular ridge from posterior corner of eye above tympanum, ending about shoulder; a weak skinfold across chest; no ventral disk; a U-shaped median external vocal sac in the male.

Dimensions.—Head and body, 25.5 mm.; head length, 9 mm.; head width, 9 mm.; femur, 10.5 mm.; tibia, 11 mm.; foot, 8.5 mm.; hand, 5 mm.

Color in alcohol.—Dorsum drab, with a seal brown crossbar between the eyes that is bordered anteriorly with a narrow light line; snout in front of this line pale drab gray, with a small brown spot on canthus and one in center of snout; a few similar spots on midline of back and above shoulders; throat and belly light drab, the throat nearly immaculate except for a small brown spot below commissure of jaw and another in front of shoulder, the chest and belly with a fairly heavy sprinkling of brown spots; legs, including posterior femur, fawn color above and below; upper surfaces of arms with scattered brown dots; side of head drab, immaculate except for the brown canthal spot already noted and two or three faint dark stripes from below eye to edge of upper lip; soles of feet and palms of hands ecru drab, the disks above seal brown.

Remarks.—The adpressed heel usually reaches to the center of the eye, but sometimes to its anterior or posterior border. The toes have scarcely perceptible traces of a web in most of the specimens; in the remainder a definite trace occurs, occupying up to one-eighth the length of the fourth toe. Dark spots like those in the described specimen occur on the bellies of three other frogs in the small series of Chocó frogs, but the majority have immaculate bellies. In CNHM 81841–5 from Andagoya, the bellies are slightly granular.

While Cope's type of *diastema* is still in the U.S. National Museum, it is too old and soft to be of much value for comparison with Colombian specimens. Taylor (1952, p. 701) states definitely that *diastema*, ranging from Nicaragua to Panama, has the fingers and toes "without the trace of a web." The Chocó frogs, some with a distinct small web between the toes, are only tentatively assigned to this species.

The Chocó specimens are quite distinct from Boulenger's *gularis*, known from Gorgona Island, and Valle. In that species the outline of the snout is less slender and the foot is shorter. An interesting fact drawn from analysis of the critical measurements is that the hand length, usually the least variable of such measurements, is the most variable proportionately in both *gularis* and these Chocó specimens tentatively assigned to *diastema*.

Specimens Examined

COLOMBIA

Chocó: Andagoya, CNHM 81841–5, USNM 144780; Boca de la Raspadura, AMNH 13684; Las Animas Creek, Quito River, tributary of the Atrato, AMNH 13613; Pizarro, CNHM 43993–4, USNM 147232 (formerly CNHM 43992). All are tentatively assigned to *E. diastema*.

NICARAGUA: USNM 14197, 14209; Hacienda Rosa de Jericho, 3,250 ft., BM 94.7.26.63.

PANAMA: Culebra, USNM 53732; Mary Caretta (=Margheretta), USNM 25170–1 (cotypes); Río Calobre, USNM 53718; Barro Colorado Island, BM 1937.6.9.3, USNM 148203.

***Eleutherodactylus gularis* (Boulenger)**

Plate 58d–f

1898. *Hylodes gularis* Boulenger, 1898a, p. 121, pl. 15, fig. 3 (type locality, "Cachabé, Western Ecuador").—Nieden, 1923, p. 447, fig. 334.

1926. *Eleutherodactylus gularis.*—Parker, p. 553.

Description.—USNM 145134, an adult male from Gorgona Island, sea level to 90 meters, Colombia. Faint parallel bony ridges on top of head between the eyes. Vomerine teeth in two short, heavy, transverse, widely separated series behind the choanae; tongue one-half as wide as mouth opening, oval, its posterior border free and unnotched; snout nearly truncate at tip when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils lateral, strongly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis rounded; loreal region slightly concave, flaring outwards to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter 2½ times that of upper eyelid, a little greater than interval between nostrils. Tympanum small but distinct, its greatest diameter one-third that of eye, separated from eye by an interval equal to two-third its own diameter. Fingers very short, their disks pointed, with lateral ridges and very small webs at the base, first finger much shorter than second, fourth longer than either, its disk reaching to base of disk of third, which nearly covers the tympanum; a crescentic thumb pad present; an indistinct palmar callus; metacarpal tubercles scarcely developed. Toes short, nearly one-fourth webbed, third toe shorter than fifth, the disk of which reaches almost to base of antepenultimate phalanx of fourth; disk of fourth toe nearly covering the tympanum and equal to that of third finger; a very small inner metatarsal tubercle; outer metatarsal tubercle absent; no true tarsal ridge; a distinct skinfold on heel and knee. Body short, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels are slightly separated. Skin of upper parts smooth, with a few short, weak glandular lines above shoulders and along sides; venter smooth except for some fine transverse ridges across throat, and some granules behind vent and on posterior femur; a very indistinct glandular ridge from posterior corner of eye above tympanpm, ending above shoulder; a heavy skinfold across chest; traces of a ventral disk; a prominent external vocal sac in the male, appearing as a U-shaped fold of skin on the throat with lateral prolongations.

Dimensions.—Head and body, 23.5 mm.; head length, 8.5 mm.; head width, 8.5 mm.; femur, 9 mm.; tibia, 9.5 mm.; foot, 6.5 mm.; hand, 4 mm.

Color in alcohol.—Dorsum primrose yellow, with very minute gray dots all over, these being concentrated into a transverse bar between the eyes, and a few widely scattered larger dots along the midline and also towards the dorsolateral region; sides primrose yellow with similar minute dots; venter maize yellow, the throat and belly immaculate, the lower limbs with a few fine punctulations; side of head primrose yellow, immaculate except for some gray dots on canthus and above tympanum; palms of hands and soles of feet primrose yellow, the disks light gray below and dark gray above.

Remarks.—The adpressed heel reaches the center of the eye in half the examples at hand, and to the posterior border of the eye in the remainder. The toes are webbed very slightly in 25 percent of the examples, while the others have more than a "trace," with about one-eighth of the fourth toe webbed. The venter is always immaculate, but the dorsum is sometimes darker than in the described specimen, with a broad median stripe of sepia or wood brown from the dark interocular bar to end of body. This dark bar is often bordered above by a white one. The toe and finger disks appear nearly black in contrast to the paler tone of hands and feet.

The best characters by which to recognize this species are the very short hands and feet with pointed fingers and toes, of which the entire terminal disk is dark gray, and the enormous U-shaped gular pouch of the males, a character that is shared, however, with *diastema*.

Specimens Examined

COLOMBIA

Cauca: Gorgona Island, BM 1926.1.20.139–40, USNM 145124–36.
Valle: Lower Río Calima, USNM 145081; Virology Field Station, Río Raposo, USNM 151396–8, 151400.

Eleutherodactylus cornutus cornutus (Jiménez de la Espada)

Plate 59a–c

1871. *Limnophys cornutus* Jiménez de la Espada, p. 60 (type locality, San José de Moti, Suno, Ecuador).
1872. *Strabomantis cornutus.*—Jiménez de la Espada, 1872, p. 85; 1875, pl. 3, figs. 4, 4a–c.
1882. *Hylodes cornutus.*—Boulenger, 1882a, p. 220.—Peracca, 1914, p. 107.—Nieden, 1923, p. 443.
1945. *Lithodytes cornutus.*—Anderson, 1945, p. 45.

1959. *Eleutherodactylus cornutus.*—Ginés, 1959, p. 112, fig.
1961. *Eleutherodactylus cornutus cornutus.*—Rivero, 1961, p. 55.

Description.—MCZ 19640, an adult from Pastaza River, Ecuador. Heavy, smooth, bony ridges on top of head. Vomerine teeth in two very heavy, transverse, arc-shaped, almost contiguous series behind the choanae; tongue broadly cordiform, three-fifths as wide as mouth opening, its posterior border free and sightly notched; snout broad and rather short, rounded when viewed from above, slanting forward in profile, the upper jaw extending a little beyond the lower, which is obtusely pointed in front. Nostrils superolateral, projecting, their distance from end of snout 1¼ times their distance from eye, separated from each other by an interval less than their distance from eye. Canthus rostralis rounded; loreal region concave, the upper lip flaring out below it. Eye rather small and deepset, its diameter about one-half its distance from tip of snout; interorbital diameter almost twice that of upper eyelid, slightly greater than interval between nostrils. Tympanum large, distinct, its greatest diameter five-sixths that of eye, separated from eye by an interval equal to its own diameter. Fingers moderate, with lateral ridges, free first finger much longer than second, with bulbous tips instead of disks, a large oval thumb pad and a flat palmar callus present; metacarpal tubercles distinct. Toes long, free, third toe longer than fifth, with small but distinct disks, disk of fourth toe covering about one-eighth the tympanum; a long oval inner metatarsal tubercle and a very small round outer one; a heavy tarsal ridge extending almost to heel; a distinct skinfold on heel and knee. Body heavy and thickset, in postaxillary region narrower than the unusually wide head. When hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels considerably overlap. Dorsum heavily granular, with elongate glands on parietal region near base of skull and on center of back; scattered large pustules in rows across hind legs corresponding to the dark bands; venter coarsely granular with somewhat smaller granules on chin; a pair of heavy longitudinal ridges between the eyes; a small dermal horn on upper eyelid; a narrow glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a faint skinfold across chest; a ventral disk present.

Dimensions.—Head and body, 56.5 mm.; head length, 21.5 mm.; head width, 27 mm.; femur, 26.5 mm.; tibia, 29 mm.; foot, 27 mm.; hand, 15 mm.

Color in alcohol.—Dorsum drab, with a wide sepia interorbital band preceded by a narrower pinkish buff band; clove brown spots and short stripes emphasizing the glandular ridges on back; a sepia line from upper lip to middle of canthus; three radiating sepia lines below eye to upper lip; upper limb surfaces fawn color, with diagonal sepia crossbars marked with clove brown wherever glandular ridges or tubercles occur; sides of body immaculate ochraceous-buff; posterior femur seal brown with several large white (yellow in life?) spots; anterior femur similar but paler; venter immaculate vinaceous-buff anteriorly to ecru drab posteriorly; soles and palms seal brown, the tubercles and distal parts of digits wood brown to buff.

Remarks.—In the examples at hand, the adpressed heel reaches to the anterior border of the eye or to the nostril. A trace of web appears between the toes, but it is poorly developed in all specimens.

The Venezuelan *maussi* of Boettger, 1893, is related to *cornutus*, in fact, Rivero (1961, p. 54) called the Venezuelan frog *Eleutherodactylus cornutus maussi.*

Specimens Examined

COLOMBIA

Antioquia: El Clara Creek, 6 miles from Angelópolis, AMNH 38639, 38649, 39978–80; Valdivia, CNHM 69742.

Magdalena: West side of Sierra Nevada de Santa Marta, MCZ 17577.

Tolima: Quindío Mountains, MCZ 8237–40.

ECUADOR: Canelos to Marañon, Pastaza River, USNM 139897; Pastaza River, MCZ 19640–1.

Genus *Eupemphix* Steindachner

1863. *Eupemphix* Steindachner, p. 188 (type species, *E. nattereri* Steindachner).

Generic diagnosis.—Pupil horizontal. Tongue elliptical, entire and free behind. Vomerine teeth lacking. Tympanum distinct or hidden. Fingers free; toes free or nearly so. Tips of digits somewhat thickened, with divided or anchor-shaped terminal phalanges. Omosternum cartilaginous; sternum with a bony style. Transverse diapophyses of sacral vertebra much broadened.

Eupemphix pustulosus (Cope)

Plate 60a–c

1864. *Paludicola pustulosa* Cope, p. 180 (type locality, New Granada on River Truando [probably Chocó]).

1873. *Bufo* (*Microphryne*) *pustulosa.*—Peters, 1873b, p. 616.—Brocchi, 1882, p. 86, pl. 8, figs. 1, 1a-d.

1876. *Microphryne pustulosa.*—Cope, 1876, p. 155.

1882. *Engystomops pustulosus.*—Boulenger, 1882a, p. 275.—Boettger, 1892, p. 33.—Werner, 1899, p. 480.—Günther, 1901, p. 242.—Breder, 1946, p. 397, figs. 8–10.—Mertens, 1952a, p. 22, pl. 8, figs. 31, 32.—Griffiths, 1954, p. 46.—Starrett, 1960, p. 8.

1882. *Eupemphix pustulosus.*—Boulenger, 1882b, p. 188.—Boettger, 1893, p. 40.—Ruthven, 1922, p. 54.—Beebe, 1924, p. 45.—Noble, 1927, p. 88, fig. 17.—Dunn, 1944c, p. 512.—Aleman, 1952, p. 26.—Bhaduri, 1953, p. 38, fig. 16, pl. 10, fig. 56.—Ginés, 1959, p. 116, fig.—Fouquette, 1960d, pp. 201, 210, fig. 1, table 3.—Bokermann, 1962b, p. 391.—Turner, 1962, p. 309.—Heatwole, Soleno, and Heatwole, 1965, p. 355.

1893. *Eupemphix pustulosa.*—Boettger, p. 40—Nieden, 1923, p. 165, fig. 215.—A. Lutz, 1927, pp. 38, 42, pl. 12, figs. 25, 26.—Gorham, 1963, p. 18.

1896. *Eupemphix trinitatis* (not of Boulenger).—Peracca, 1896, p. 11; 1914, p. 107.

1901. *Engystomops stentor* (not of Jimínez de la Espada).—Steindachner, 1901, p. 111.

1930. *Eupemphix ruthveni* Netting, p. 167 (type locality, Fundación, [Magdalena,] Colombia).—Dunn, 1944c, p. 512.—Ginés, 1959, p. 116.

1961. *Eupemphix pustulosus ruthveni.*—Rivero, 1961, p. 90; 1964a, p. 301, 1964b, p. 311; 1964c, p. 493.

Description.—USNM 147024, an adult male from San Gil, Santander, Colombia. Tongue small, one-third as wide as mouth opening, oval, its posterior border free and pointed; snout straight-sided, bluntly rounded at the tip when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, distinctly projecting, their distance from end of snout about one-third their distance from eye. Canthus rostralis rounded; loreal region slightly concave, descending almost vertically to upper lip. Eye large, prominent, its diameter slightly greater than its distance from tip of snout; interorbital diameter a little greater than that of upper eyelid, greater than interval between nostrils. Tympanum indistinct, its greatest diameter apparently about one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers very long, with lateral ridges, the tips swollen, free, first finger a little shorter than second, fourth equal to second and reaching just beyond base of penultimate phalanx of third; a tubercular thumb pad present; a prominent palmar callus; metacarpal tuberclers very well developed. Toes long, with traces of webs at the base, third toe a little longer than fifth, its tip reaching base of antepenultimate phalanx of fourth; tips of toes rounded and a little swollen, like those of fingers, and equal to them in size; a small pointed oval inner metatarsal tubercle and a smaller round but projecting, outer one; no true tarsal ridge; a pointed tubercle on inside of tarsus midway to heel; a prominent skinfold on heel and knee. Body stout, in postaxillary region a little wider than greatest width of head. When hind leg is adpressed, heel reaches center of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts warty, some of the warts arranged in parallel rows as follows: a pair of rows on snout, top of head, and shoulders and disappearing at midbody; another pair beginning at posterior eyelids and converging towards sacrum, becoming indistinct above venter; other warts prominent on dark leg bands. Venter very finely granular, with heavy granulations on femur around the vent; a weak glandular ridge from posterior corern of eye above tympanum, a swollen indistinct parotoid gland above and behind tympanum; a skinfold across the chest; no ventral disk; in the male, a large median external vocal sac with many longitudinal folds most prominent on the sides of the throat.

Dimensions.—Head and body, 30 mm.; head length, 9.5 mm.; head width, 10 mm.; femur, 12.5 mm.; tibia, 12 mm.; foot, 13 mm.; hand, 9.5 mm.

Color in alcohol.—Dorsum sepia, with slightly darker areas around the bases of the warts; side of body sepia to pale cinnamon below, with several diagonal rows of small seal brown spots; side of head wood brown with faint indications of a darker spot below eye; belly light wood brown with several medium-sized clove brown spots; chest russet; throat of male clove brown, the edges of the jaw russet; limbs cinnamon with one or two darker crossbands; posterior femur wood brown very slightly marbled with darker brown; lower surface of femur pale wood brown with numerous small darker spots; anterior femur pale cinnamon with slight continuations of the dark crossbands; palms of hands and soles of feet cinnamon, their disks a little darker.

Remarks.—The chief characters given in the original description of *ruthveni* to separate it from *pustulosus* are the more granular belly, which is immaculate posteriorly or marbled with small, light brown spots, and the lack of large spots on the lower femoral surfaces. *E. pustulosus*, on the contrary, was said to have a less granular belly with larger dark coalescing spots, and large spots on the lower femur. The difficulties are further increased by Dr. Netting's statement that "Both *E. pustulosus* and *E. ruthveni* occur in Fundación, Colombia (the type locality of *ruthveni*), and the ranges of the two species may be found to overlap throughout large areas in northern South America."

Graphs compiled from the critical measurements of Colombian frogs with light-spotted or immaculate venters and others with dark-spotted bellies show no significant differences in the body proportions of the two groups. In a series of 27 specimens of *pustulosus* from El Real, Darién Province, Panama, the belly is pale in 10 individuals, dark in 13, and medium-shaded in four. Three of the dark-bellied frogs had a light midventral line not invaded by the dark spotting; two had only a few fairly large dark ventral spots, and eight had many smaller ones. Considerable variation in the ventral coloration therefore exists in a series of *pustulosus* from the same locality.

As to the spotting of the lower femur, results are slightly more conclusive. In six Magdalena frogs considered to be "*ruthveni*," the lower femur is immaculate. Of 27 Santander frogs, the lower femur is immaculate in one, has pale spots (many or few) in eight, and has black or medium-brown spots (many or few) in 18. Of 52 specimens from the mainland of Panama, the lower femur is immaculate in none, has pale spots in five, and black or medium spots in the others. Of eleven topotypes (in USNM) of *stentor* (Espada) from Taboga Island, Panama, ten have black or medium spots and the remaining specimen has pale spots on the lower femur.

The belly granulations appear to be about equally developed when fairly large series of *pustulosus* and "*ruthveni*" are compared, while the adpressed heel may or may not reach the eye in each group.

While the dorsal pattern in freshly collected examples of Panamanian *pustulosus* appears to be a little more apparent than in "*ruthveni*," an occasional example of the latter may display a pattern as contrasting as in any *pustulosus* specimen, and the linear glandules and longitudinal dark striping of an occasional specimen of either form reminds one of the *trinitatis* pattern.

Specimens of *pustulosus* and "*ruthveni*" were compared with the eleven topotypes of *stentor*. In the latter, the dorsal skin is almost smooth to faintly pustular, and this character is sufficient to distinguish *stentor* from *pustulosus* or "*ruthveni*," both of which have very rugose backs, often with the tubercles in short or long rows, either transverse, diagonal, or longitudinal. Apparently the species *stentor* does not occur on the mainland of Central or South America, being restricted to Taboga Island.

Because of the presence of intergrades in collections of several frogs from one locality, it seems reasonable to include *ruthveni* in the synonymy of *pustulosus*.

Specimens Examined

COLOMBIA

Antioquia: Casabe, USNM 147016; Chigorodó, USNM 151893–900; Sampedro, AMNH 38712.

Atlántico: Barranquilla, DZSP 6006–32; Palmar de Varela, Ponedera, south of Barranquilla, Río Magdalena, USNM 144818.

Bolívar: Coloso, east of Tolúviejo, 250 m., USNM 152655; Hacienda La Aguada, 22 km. from San Onofre, USNM 152648–52; Sincelejo, USNM 144819, 150742; Tolúviejo, DZSP 5439–41.

Córdoba: Río Manso, tributary of upper Río Sinú, USNM 151027–30.

Cundinamarca: Apulo, USNM 144820; one km. east of Girardot, USNM 146219; San Javier, La Mesa, USNM 144821–3; Bogotá, JRT (2).

Guajira: Thirty km. south of Castilletes, USNM 152657 (3 juv.); Piojo, 100 m., USNM 152658–75.

Magdalena: Cienaga, Casa Blanca, USNM 144155–6; Curumaní, USNM 118174; Finca El Aranar, Bonda, USNM 152695–712; Fundación, USNM 118717 (paratype of "*ruthveni*"); Santa Marta Mountains, MCZ 15698 (paratype of "*ruthveni*"); Río Frío, MCZ 16057–8; Larilla, MCZ 16076; between Mamatoco and Tigrera, CM 5455 (paratype of "*ruthveni*"); CAS 54790.

Norte de Santander: Astillero, Río Zulia, USNM 147017–21; Finca Miramonte, 15–20 km. north of Camp Tibú, Catatumbo, USNM 145083–7.

Santander: El Centro, USNM 144824–5; La Gerona, east of Lebrija, USNM 144831; Quebrada "La Lechera," Vélez, USNM 144826–30; San Gil, USNM 147022–8, CM 7939–64.

Tolima: Honda, 3,400 ft., BM 1909.7.23.39.

MEXICO: Oaxaca: Five mi. north of Tehuantepec, USNM 140114–22.

PANAMA: Buhio Soldado, USNM 25184; Canal Zone, USNM 54294; Fort Kobbe, Canal Zone, USNM 140494–512; Chagres River, Indio, USNM 102851; Río Paya, Darién, USNM 140063; near mouth of Pacora River, Darién, USNM 102720; near Chucunaque and Ucurganti Rivers, Darién, USNM 140620–6; El Real, Darién, USNM 140540–64; Porto Bello, USNM 48524; Río Mamone, USNM 53992.

Genus *Hydrolaetare* Gallardo

1963. *Hydrolaetare* Gallardo, p. 42 (type species, *Limnomedusa schmidti* Cochran and Goin).

Generic diagnosis.—Pupil round. Tongue broad, cordiform, free and notched behind. Maxillary and premaxillary teeth present; vomerine teeth between the large choanae. Tympanum very distinct. Fingers pointed, with small webs; toes extensively webbed, pointed. Clavicles and coracoids ossified; precoracoids reduced and cartilaginous. Shoulder girdle arciferous; omosternum and xiphisternum cartilaginous; style bony. Sacrum with strong, cylindrical processes, articulating with the urostyle by a double condyle. Tips of phalanges simple.

Hydrolaetare schmidti (Cochran and Goin)

Plate 60d–f

1959. *Limnomedusa schmidti* Cochran and Goin, p. 208 (type locality, near Leticia, Amazonas, Colombia).

1963. *Hydrolaetare schmidti.*—Gallardo, 1963, p. 42.

As no additional specimens have come to hand, the original description (Cochran and Goin, 1959) is repeated, as follows:

Type.—USNM 140245, adult male, collected in the forest near Leticia, Amazonas Comisaria, Colombia, during March, 1956, by E. Ross Allen.

Diagnosis.—A large *Limnomedusa* with extensive webbing between the toes, and extensively developed dark mottlings on the ventral surface of the body and legs. From both *macroglossa* and *misionis*, it differs in being much larger (82.0 mm. snout-vent length as compared to 49.0 for a large female *misionis* and 58.6 for the largest *macroglossa* at hand).

From both of these forms it also differs in having the toes much more extensively webbed, the web extending to the base of the penultimate phalanx of the fourth toe and to the base of the ultimate phalanx of the other toes. In *schmidti* the vomerine tooth patches are slightly larger and more arched than in *macroglossa*.

The most striking feature of *schmidti*, however, is its coloration—its very dark, nearly black, dorsal ground color, and the extensively developed blotching on the ventral surface of the body and limbs set it off at a glance.

Description.—Vomerine teeth in two short, heavy, slightly arched series, between and on a line with the posterior margin of the internal nares; tongue broadly cordiform, its posterior margin free and with a very shallow notch; snout large, broadly rounded as seen from above, except for the tip which is somewhat truncate; tip of snout forming a broadly obtuse angle as seen in profile; upper jaw extending slightly beyond lower; nostrils nearer tip of snout than eye, separated by a distance about equal to their distance from the eye; internarial distance half again as great as interocular distance; eye prominent, its greatest diameter greater than distance from eye to nostril and nearly twice the interocular distance; canthus rostralis not prominent; loreal region slightly concave; tympanum moderate in size and very distinct, separated from eye by about one and one-half times its own diameter; greatest diameter of eye about twice that of tympanum. Fingers pointed, not webbed at base, the third the longest, the second and fourth subequal and extending to the base of the penultimate phalanx of the third; the terminal phalanx of the first finger strongly flexed; first finger slightly longer than second and fourth; no evident pollex rudiment. Toes slender, pointed, 4-3-5-2-1 in decreasing order of length, webbed to the base of the penultimate phalanx of the fourth toe and the base of the ultimate phalanx of the others; a small outer and a larger inner metatarsal tubercle on each foot. Legs short, heel reaching posterior margin of eye when leg is pressed along side of body; elbow and knee just meeting when arm and leg are pressed along side; heels slightly overlapping when hind legs are held at right angles to body. Skin of dorsum rough and finely warty, particularly along sides; skin on snout and top of head smooth but upper eyelids covered with fine warts; a narrow glandular fold extending from posterior corner of eye to above tympanum where it turns down and is lost in the wartiness of the sides; no apparent subgular vocal pouch.

Dimensions (*in mm.*).—Snout-vent length, 82.0; head length, 30.0; head width, 34.6; crus, 32.3; shank, 36.3; pes, 62.3; hand, 20.4.

Color in alcohol.—Top of head and dorsum very dark brownish gray; a light gray band on each side extending from below eye to anterior margin of tympanum; the region of the dorsum immediately behind the eyes just perceptibly paler than rest of dorsum; tops of arms and legs slightly paler than dorsum, with blotches of dark grayish black, these mottlings taking the form of indefinite crossbars on the thighs; ground color of ventral surface dirty white; a few dots of grayish black pigment under tip of chin; along the posterior border of jaws, across the chest and belly, and under the arms extensive mottlings of dark grayish black, these mottlings becoming confluent on the undersides of the thighs and shanks so that they form definite reticulations.

Genus *Leptodactylus* Fitzinger

1826. *Leptodactylus* Fitzinger, p. 38 (type species, *Rana fusca* Schneider).

Generic diagnosis.—Pupil horizontal. Tongue oval and rounded, entire or slightly notched and free behind. Vomerine teeth between the choanae. Tympanum usually distinct. Fingers and toes free, not (or only slightly) dilated at the tips. Outer metatarsals united. Omosternum cartilaginous; sternum with a bony style. Terminal phalanges simple.

Key to Colombian Species of *Leptodactylus*

a^1. Toe tips dilated into disks; first finger shorter than second; size to 29.5 mm . . . . **L. marmoratus hylaedactylus**

a^2. Toe tips not dilated into disks: first finger longer than second.

b^1. Two or more strong dorsolateral folds.

c^1. Dorsolateral folds not more than two.

d^1. Dorsolateral folds not extending beyond sacrum; toes with slight fringes; legs marbled with red or orange in life; male with two breast spines and one thumb spine, but no external vocal sac; size to 187 mm . . . . **L. pentadactylus**

d^2. Dorsolateral folds extending to level of groin, or beyond.

e^1. Lateral fringes of toes distinct; no line along posterior femur.

f^1. Heels not overlapping when bent at right angles to body; vomerine teeth not reaching to level of choanae; size to 70 mm. **L. rhodomystax**

f^2. Heels overlapping considerably when bent at right angles to body; vomerine teeth reaching to or beyond posterior level of choanae; two breast spines in male; size to 96.5 mm. **L. insularum**

e^2. Lateral fringes of toes absent or faint.

f^1. A light postfemoral stripe, or at least a trace of one.

g^1. A light stripe along margin of upper lip to shoulder; size to 61.5 mm . . . . **L. mystaceus**

g^2. No uninterrupted light stripe along upper lip.

h^1. Postfemoral stripe narrower and less distinct; the dark canthal stripe sometimes interrupted before reaching eye; size to 47.5 mm . . . . . . **L. poecilochilus diptychus**

h^2. Postfemoral stripe wider and sharper; the dark canthal stripe usually reaching the eye; size to 43 mm. **L. poecilochilus poecilochilus**

f^2. No white postfemoral stripe; size to 68.5 mm. . . . . . **L. rubido**

c^2. Dorsolateral folds more than two; snout pointed, projecting well beyond the mouth; fringes of toes absent or slight; a light line or regular series of spots along posterior femur; two black lateral external vocal sacs in male; size to 56.5 mm . . . . **L. sibilatrix**

b^2. No dorsolateral folds, or very weak ones scarcely extending beyond axilla; toes with distinct lateral fringes; male with two thumb spines.

c^1. Back uniform brown, or sometimes a longitudinal light midline bordered with dark; underparts light except for dark spots on chin and on lower femoral surface; yellow or orange ventral tints reduced; size to 50 mm. . . . . **L. intermedius**

c^2. A dark triangle between the eyes, continued backwards as dark irregular patches on a lighter ground; no middorsal light line; underparts darker; dorsum rougher; size to 63.5 mm. **L. podicipinus petersi**

Leptodactylus marmoratus hylaedactylus (Cope)

Plate 61a–c

1868. *Cystignathus hylaedactylus* Cope, p. 115 (type locality, Napo or Upper Marañon).

1882. *Leptodactylus hylaedactylus*.—Boulenger, 1882a, p. 240.—Gadow, 1901, p. 218.—Ruthven, 1919, p. 3.—Beebe, 1919, p. 208.—Nieden, 1933, p. 489.—Crawford, 1931, p. 29.—Miranda-Ribeiro, 1937a, p. 56.—Schubart, 1939, p. 53.—Cochran, 1955, pp. 307, 309.—Goin and Layne, 1958, p. 101.—Goin, 1959a, p. 139.—Ginés, 1959, p. 114.—Gorham, 1963, p. 19.

1961. *Leptodactylus marmoratus hylaedactylus*.—Rivero, p. 133; 1964b, p. 311.

Description.—USNM 147035, an adult male from Puerto Nariño, Amazonas, Colombia. Vomerine teeth in two wide, slanting, well-separated series behind the choanae; tongue one-half as wide as mouth opening, oval, its posterior border free and unnotched; snout moderate, rounded when viewed from above, with a ridge bordering upper lip in profile, the upper jaw extending considerably beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout equaling their distance from eye. Canthus rostralis distinct but rounded; loreal region flat, oblique, sloping to the upper lip. Eye large, prominent, its diameter a little less than its distance from tip of snout; interorbital diameter a trifle greater than that of upper eyelid; equal to interval between nostrils. Tympanum distinct, its greatest diameter about three-fifths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers moderate, with faint lateral ridges, free, first, second, and fourth subequal, reaching to base of ultimate phalanx of third finger; a small oval thumb pad present; a round palmar callus; metacarpal tubercles well developed. Toes long, third toe longer than fifth, and reaching to center of antepenultimate phalanx of fourth; toes with rounded tips which are not wider than the digital articulations; tarsus distinctly granular; a small oval inner metatarsal tubercle and a smaller round outer one; a tarsal ridge, ending near heel; a series of skinfolds on heel and knee. Body rather stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow fail to meet; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts shagreened, with numerous low glandular ridges especially on sides and sacral region; venter smooth; a distinct glandular ridge from posterior corner of eye above tympanum, forking, and continuing along the sides, part as a lateral fold and part ending behind tympanum; a skinfold across the chest; a large flat pre-inguinal gland present; a ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 25.5 mm.; head length, 8.5 mm.; head width, 8.5 mm.; femur, 9 mm.; tibia, 11 mm.; foot, 12.5 mm.; hand, 5.5 mm.

Color in alcohol.—Dorsum chocolate anteriorly, lightening to cinnamon rufous posteriorly, and with a pale ochraceous middorsal stripe from between shoulders to anus; an indistinct darker patch between upper eyelids prolonged to the beginning of the light middorsal stripe; glandular ridges above ear and on back seal brown, the large pre-inguinal glandules clove brown; sides of body olive-buff, with a few small darker spots behind axilla; venter cream buff, immaculate except for some gray suffusions around edge of lower jaw and on the exterior lateral vocal pouches. Side of head chocolate, lighter on edge of rim along upper lip, with a dark oblique spot from anterior eye to lip border, and a few smaller dark spots along upper lip and in front of tympanum; gland at mouth commissure cream buff; anterior and posterior femur dull buff, immaculate; upper limb surfaces pale cinnamon-rufous, with three dark brown crossbands on tibia and traces of these on femur and foot; two similar dark brown bands on forearm; palms and soles cinnamon, with dark spots between joints.

Remarks.—The tarsus in most of the adult frogs is strongly granular, but in the half-grown ones it is only faintly so. The adpressed heel reaches to the posterior corner of the eye in most examples, and to the center of the eye in a few. The venter is unspotted in most individuals, but occasionally there are some faint darker suffusions on chin and chest.

In comparing critical measurements of the 30 Colombian specimens at hand, the tibia and foot of the 11 Amazonas frogs were found to average slightly longer proportionately than for the series as a whole, but the difference was not significant.

Specimens Examined

COLOMBIA
- AMAZONAS: Leticia, UF 10019-1–4, MLS 20, 20a; Puerto Nariño, USNM 147032–5; Río Apaporis, USNM 144843.
- CÓRDOBA: Tierra Alta, CNHM 61802, 61805.
- BOYACÁ: Caño de la Hermosa, CNHM 81918.
- CAQUETÁ: La Providencia, MLS 57; Florencia, USNM 147036–7; Villa María, USNM 146971–3, 147038.
- META: Villavicencio, CNHM 81798, 81795–7, 81799–800, USNM 144844–6, MLS 89.

BRAZIL: Oyapock, USNM 115511–2, 115514; Oyapock River, MCZ 25722; Santarem, MCZ 355.

SURINAM: Paramaribo, MCZ 17925.

VENEZUELA: Caripito: USNM 117090–1; Puerto Ayacucho, near Venado, USNM 80674.

Leptodactylus pentadactylus (Laurenti)

PLATE 61D–F

1768. *Rana pentadactyla* Laurenti, p. 32 (type locality, "in Indiis").

1799. *Rana ocellata* (not of Linnaeus).—Schneider, 1799, p. 117.—Daudin, 1802, p. 61, pl. 19; 1803, p. 118.—Gravenhorst, 1829, p. 42.
1830. *Cystignathus pachypus.*—Wagler, 1830, p. 203 (part).
1838. *Cystynathus ocellatus.*—Tschudi, p. 78 (part).
1841. *Cystignathus ocellatus.*—Duméril and Bibron, p. 396 (part).—De Betta, 1876, p. 695.
1865. *Gnathophysa labryrinthica.*—Cope, p. 112.
1865. *Gnathophysa ocellata.*—Cope, 1865b, p. 112; 1866a, p. 73.
1873. *Cystignathus pentadactylus.*—Peters, 1873a, p. 198.
1875. *Leptodactylus goliath* Jimínez de la Espada, p. 57 (type localities, Quijos, Archidona, Chuntambo, Sierra de Guacamayos, eastern Ecuador).
1875. *Leptodactylus stenodema* Jimínez de la Espada, p. 64 (type locality, San José de Moti, Canton de Quijos, Ecuador).
1882. *Leptodactylus pentadactylus.*—Boulenger, 1882a, p. 241 (part); 1898a, p. 122; 1913, p. 1025.—Günther, 1901, p. 212 (part).—Peracca, 1904, p. 34.—Barbour, 1914, p. 251.—Baumann, 1917, pp. 132, 138.—Beebe, 1919, p. 209; 1925, p. 123.—Ruthven, 1922, p. 54.—Nieden, 1923, p. 473 (part).—Breder, 1925, p. 328; 1927, p. 72; 1946, p. 402.—L. Müller, 1927, p. 259.—A. Lutz, 1927, p. 40.—Ditmars, 1929, p. 53.—Crawford, 1931, p. 30.—Crawford and Jones, 1933, p. 88.—Hellmich, 1939, p. 393, fig. 12.—Dunn, 1944, p. 511.—H. Travassos, 1947, pp. 619-627.—B. Lutz, 1948, p. 30.—Valente, 1949, p. 335.—Schreiber and Velucci, 1951, p. 73.—Houssay, 1952, p. 137.—Johnson, 1952, p. 284.—Oltmanns, 1952, p. 370.—Bhaduri, 1953, p. 35, pl. 9, figs. 52, 53.—Vinton, 1951, p. 73.—Cei, 1953, p. 510; 1956, p. 43, figs. 58, 59.—Brattstrom and Howell, 1954, p. 116.—Ginés, 1959, p. 114.—Goin, 1959, p. 136.—Fouquette, 1960d, pp. 201, 209, fig. 11, table 2.—Cochran, 1961, p. 62, pl. 26.—Gallardo, 1961b, p. 34.—Gorham, 1963, p. 19.
1927. *Leptodactylus pentadactylus pentadactylus.*—L. Müller, p. 279.—Parker, 1935, p. 507.—Andersson, 1945, p. 47, fig. 16.—Lutz and Kloss, 1952, p. 640.—Goin and Layne, 1958, p. 100.—Rivero, 1961, p. 35; 1964a, p. 298.

Description.—USNM 147053, an adult female from Leticia, Amazonas, Colombia. Vomerine teeth in two heavy, Λ-shaped, narrowly separated series between the choanae; tongue large, two-thirds as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout moderate, rounded when viewed from above, sloping towards the lip border in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, scarcely projecting, their distance from end of snout two-third their distance from eye. Canthus rostralis strongly defined; loreal region concave, sloping to the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers moderate, with heavy lateral ridges, free, first finger longer than second and fourth and reaching halfway on ultimate phalanx of third; an oval thumb pad present; a palmar callus; metacarpal tubercles well developed. Toes slightly webbed at base, long, with heavily fringed lateral ridges, third toe longer than fifth, reaching beyond base of antepenultimate phalanx of fourth; toes and fingers with small bulbous tips; a small but prominent oval inner metatarsal tubercle and a small, indistinct, rounded outer one; a heavy tarsal ridge, ending near heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to tip of snout; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts smooth; a narrow dorsolateral fold from posterior corner of eye, diminishing and soon disappearing on sacrum; venter smooth, except for coarse granules on lower and posterior parts of femur; a heavy glandular ridge from posterior corner of eye above tympanum, ending above corner of mouth, a weak branch from this going backwards on the sides and disappearing there; a skinfold across chest; a slight ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 124 mm.; head length, 43 mm.; head width, 51 mm.; femur, 56 mm.; tibia, 63 mm.; foot, 63.5 mm.; hand, 31 mm.

Color in alcohol.—Dorsum wood brown anteriorly to hazel posteriorly, a broad sepia interocular bar edged with a narrow darker line, and several irregular sepia crossbars on back also with dark outlines; a clove brown stripe beginning at tip of snout, continuing along loreal region and on sides of body below dorsolateral lines; upper leg surfaces clove brown, with scarcely a trace of crossbars; sides of body sepia, lightening to drab ventrally; a clove brown line along supratympanic ridge ending above shoulder; side of head drab to drab gray, with three large burnt umber spots along lip borders, the first and third spots extending vertically to nostril and eye respectively; posterior femur drab above, to seal brown below, with three or four rather small black bars crossing the lighter area, and other black bars on concealed surface of tibia; venter raw umber anteriorly to drab posteriorly with many small yellowish dots anteriorly, increasing in size to failry large round pale spots on posterior belly and legs.

Remarks.—The young of this form often are deceptively different from the adult in pattern. Colors and design appear more brilliant in 3- or 4-inch-long individuals. As in the other wide-ranging species, further study of specimens from all parts of the range is needed before definite recognition or suppression of some of the names now synonymized can be decided upon. The currently accepted synonymy has been given here, but a future monographer should compare examples from each type locality before rendering a final decision.

As *labyrinthicus* (Spix) from eastern Brazil seems to be fairly well characterized, it is not included above.

Colombian Specimens Examined

AMAZONAS: Leticia, MLS 271 ,USNM 147053, UF 8536; Río Apaporis, USNM 144847.

CAQUETÁ: Florencia, MLS 293 (juv.); 4 km. east of Florencia, MLS 472; Río Mecaya, 185 m. CNHM 69752.

CHOCÓ: Boca de la Raspadura, AMNH 39792.

HUILA: Pitalito, 1,350 m., CNHM 69745.

META: Menegua, east of Puerto López, upper Río Meta, USNM 147272; Rio Guayabero, Angostura Camp No. 1, USNM 150490; Serranía de La Macarena, Río Guapaya, 330 m., CNHM 81337; San Juan de Arama, Los Micos, 400 m., CNHM 81329.

VALLE: Lower Río Calima, USNM 145094, 150756; Virology Field Station, Río Raposo, USNM 151460–2.

Leptodactylus rhodomystax **Boulenger**

PLATE 61G–I

1884. *Leptodactylus rhodomystax* Boulenger, 1884a, p. 637 (type locality, Yurimaguas, Huallaga River, northern Peru); 1886b, p. 413.—Nieden, 1923, p. 481.—L. Müller, 1923, p. 46.—Parker, 1935, p. 508.—Rivero, 1961, p. 37.—Gorham, 1963, p. 19.

Description.—BM 1939.1.1.38, an adult female from New River, British Guiana. No bony ridges on top of head. Vomerine teeth in two transverse, short, arc-shaped series, nearly touching each other behind the choanae; tongue two-thirds as wide as mouth opening, cordiform, its posterior border free and slightly notched; snout broadly rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout almost twice their distance from eye. Canthus rostralis bluntly rounded; loreal region concave, sloping outward to meet the upper lip. Eye large, prominent, its diameter three-fourths its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers rather short except for first finger, which is equal to third and much longer than second, with slight lateral ridges, free, their tips distinctly dilated into small round disks, disk of first finger covering about one-eighth the tympanum; a heavy projecting thumb pad present; a smaller flat palmar callus; metacarpal tubercles well developed. Toes long, third toe much longer than fifth, its disk reaching beyond base of antepenultimate phalanx of fourth; disk of fourth toe covering about one-eighth the tympanum and equal to that of first finger; a small but heavy oval inner metatarsal tubercle and a smaller round outer one; a pronounced inner tarsal ridge, ending near heel; a series of distinct skinfolds on heel and knee. Body stout, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap considerably. Skin of upper parts smooth (pustular under the lens, especially on sacrum and around venter); venter smooth, with a few faint transverse glandular ridges on posterior belly; a heavy glandular ridge from posterior corner of eye above tympanum, ending behind commissure of mouth, where it joins a very short ridge emanating from corner of mouth; a skinfold across chest; a ventral disk; external vocal sacs in the male.

Dimensions.—Head and body, 63 mm.; head length, 19.5 mm.; head width, 23.5 mm.; femur, 30.5 mm.; tibia, 28 mm.; foot, 27 mm.; hand, 15.5 mm.

Color in alcohol.—Dorsum drab, darkening to mouse gray on sacrum; a wide olive buff bar across head extending onto anterior half of upper eyelids, followed by a sepia bar; top of snout in front of eyes sepia; an indistinct sepia bar across back above shoulders; legs wood brown, femur with four or five rather narrow dark sepia crossbars, the tibia with three such bars, the middle one widest, and a few sepia bars across side of foot; a clove brown stripe along inferior border of dorsolateral folds; posterior femur and inside of tibia clove brown to black, with numerous small round white spots; groin clove brown spotted with white, an anterior prolongation of this pattern extending forward on side halfway to axilla; side of head olive buff to cream buff, with a wide dark brown band along edge of lip, and with a narrow line of cream buff extending beyond commissure of mouth and ending on shoulder; venter burnt umber to sepia anteriorly, with many small round cream buff spots; posterior half of belly and lower leg surfaces buff, with a few small drab dots towards the knee and on top of foot.

Remarks.—Rivero (1961, p. 38) has expressed doubt that AMNH 39791 from Vaupés is a member of this species. We agree with Rivero in that this frog is not *mystaceus*, which has the light, upper-lip line continuous from the tip of the snout to the shoulder, while AMNH 39791 has a spotted lip in front of the eye, the light stripe being obvious only from below the eye to the shoulder. Furthermore, *mystaceus* has an immaculate light venter (except for a few darker spots on lower lips and throat in an occasional example) while AMNH 39791 has a heavy brown reticulation on the venter.

More examples of *rhodomystax* from Colombia are needed before precise variations in color and body structure of these frogs can be determined.

Specimens Examined

COLOMBIA
  Amazonas: Río Apaporis, USNM 144889–91.
  Tolima: Espinal, MCZ 15067, 15071.
  Vaupés: Uaracapari, upper Río Vaupés, AMNH 39791.
BRITISH GUIANA: Chenapoon, BM 1905.4.1.18; New River, BM 1939.1.1.38–9; Pacaraima, BM 1933.6.19.18.
ECUADOR: Canelos, BM 80.12.5.197.
PERU: Sinchona, Huanuco, JP 0297–8; Domo Santa Clara, Orellana, USNM 127925–7; Satipo, JP 27 (7); Marankiari, JP 024; Masamari, JP 0048 (2); Río Rangoa, JP 040 (3), 042 (7); Oxypampa, JP 257; Tingo María, JP 0015 (4).

Leptodactylus insularum Barbour

Plate 62a–c

1906. *Leptodactylus insularum* Barbour, p. 228 (type locality, San Miguel Island, Bay of Panama).—Nieden, 1923, p. 477.—Minton and Smith, 1960, p. 104.—Gorham, 1963, p. 19.

Description.—USNM 76957, an adult male from Old Providence Island, [San Andrés y Providencia,] Colombia. Vomerine teeth in two heavy, well-separated, chevron-shaped series behind the choanae; tongue three-fifths as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout moderate, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis rounded and not very distinct; loreal region flat, sloping outwards to the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter equal to diameter of upper eyelid, a little less than interval between nostrils. Tympanum large, distinct, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers moderate, with lateral ridges, free, first finger a little longer than second and equal to fourth, which reaches halfway on penultimate phalanx; two horny black-tipped thumb spines in the male; a heavy thumb pad present; a small palmar callus; metacarpal tubercles well developed. Toes long, with slight webs at their bases which are prolonged as lateral ridges almost to the tips; third toe longer than fifth and reaching halfway on antepenultimate phalanx of fourth; tarsus smooth; a small oval inner metatarsal tubercle and a smaller round outer one; a narrow tarsal ridge, ending at heel; a pronounced skinfold on heel and knee. Body stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches to nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts finely shagreened, with coarse pustules on sacrum; a dorsolateral glandular line from posterior corner of eye to sacrum, and a lateral line from above shoulder to groin; a heavy glandular ridge from posterior corner of eye above tympanum, ending above shoulder; a skinfold across chest; a ventral disk; no external vocal sac; arms strongly developed and two heavy black horny excrescences on the chest (in male).

Dimensions.—Head and body, 82 mm.; head length, 29 mm.; head width, 30.5 mm.; femur, 38.5 mm.; tibia, 42.5 mm.; foot, 40.5 mm.; hand, 23 mm.

Color in alcohol.—Dorsum burnt umber, lightening to drab posteriorly and on legs; a triangular sepia interocular patch, its apex directed backwards; a clove brown line beginning at tip of snout, continuing along loreal region and paralleling the dorsolateral lines; a similar dark line on supratympanic ridge; sides of body drab with many small irregular sepia spots behind arm insertion; three or four wide dark crossbars alternating with narrow ones on top of femur, continuing on posterior femur as a dark reticulation with many scattered light spots; upper tibia with olive crossbars that become darker and larger on concealed surface of tibia; foot drab with small darker spots; upper arm drab with two or three large irregular dark spots between elbow and axilla; side of head tawny olive, with a narrow dark line bordering the mouth; venter wood brown anteriorly to ecru drab posteriorly; edges of lower jaw with small scattered russet spots, and some much paler spots on belly and lower leg surfaces; soles of feet and palms of hands mottled buff pink and pale drab; thumb spine of male black.

Remarks.—Comparing the graph of *Leptodacylus ocellatus* (in Cochran, 1955, p. 384) based on 168 specimens, mostly Brazilian, with measurements of 55 Colombian specimens of *L. insularum*, the tibia and hand are found to be significantly longer proportionately in the latter:

	L. ocellatus		*L. insularum*	
	Tibia	Hand	Tibia	Hand
Range	±37. 5–55	±20–29	45. 8–58. 9	22. 6–29. 4
Mean	48. 8	24	52. 4	26
2σ	48. 4–49. 2	23. 7–24. 3	51. 6–53. 2	25. 5–26. 5

Specimens at hand of *insularum* from Old Providence Island tend to have a slightly wider head and a longer femur than those from the mainland, although in the graphs made from these critical measurements the areas of significant variation (that is, twice the standard error from the mean) are separated by only 0.1 percent in head width and exactly adjoin in femoral length. A much larger series of frogs from Old Providence Island is needed before the significance of these slight differences can become apparent. The tarsus is completely smooth in two-thirds of the examples, and faintly granular or pustular in the remaining third. Both conditions occur in specimens from Old Providence Island as well as in those from the mainland. No differences in other structural features or in color could be found.

Specimens Examined

COLOMBIA

Amazonas: Leticia, USNM 147029–30.

Antioquia: Medellín, AMNH 38828.

Atlántico: Barranquilla, UF 7972; DZSP 6002; Barranquilla, near Airport Soledad, USNM 152641.

Bolívar: Sincelejo to Tolú, USNM 150743–9; Isla Fuerte (opposite Paso Nuevo, Córdoba), CHNM 74937 (larger); Tierra Alba, 70 m., CNHM 61807–12; Hacienda La Aguada, 22 km. from San Onofre, USNM 152653.

Boyacá: Macanal, MLS 103; MCZ 15059; Muzo, MCZ 24919; Corozal, MLS 102, 102a.

Cauca: Popayán, USNM 145781 (tentatively identified).

Córdoba: Río Manso, tributary of upper Río Sinú, USNM 151031–3; Monte Líbano, upper Río San Jorge, USNM 150759,

Cundinamarca: Beltrán, on Río Magdalena, USNM 145707–42; one mile east of Girardot, USNM 146216–8; Girardot, USNM 146393 (tentatively identified); Gurlandy, west of Girardot, MCZ 24886.

Guajira: Nazaret, USNM 115112–4 (tentatively identified); near Piojo, USNM 152676–7.

Huila: Near Palestina, USNM 148859 (tentatively identified).

Magdalena: Bonda, CM 2442; Ciénaga, USNM 144157–8; Fundación, MCZ 8966–7; Río Frío, MCZ 16067–8; Río Buritaca, USNM 150992–4 (juv.); Minca, Río Minca, on road to San Lorenzo, USNM 150926; Lower Río Manzanares between Santa Marta and Mamatoca, USNM 150893–924.

Nariño: Puerto Asís, MLS 239.

Norte de Santander: Astillero, MLS 213.

San Andrés y Providencia: Old Providence Island, USNM 76956–7, 83908 (tadpoles), 146214–5, MCZ 19261–6.

Santander: El Centro, USNM 144832–7, CNHM 81759–61, MLS 114; San Andrés, MCZ 17370–5.

Tolima: Honda, MLS 242; AMNH 22604.

PANAMA: Barro Colorado Island, MCZ 19207; Bruja Point, MCZ 10069–70; Bay of Panama, San Miguel Island, USNM 35603–4 (paratypes), 58062; Saboga Island, Pearl Islands, USNM 52404 (paratype),

Leptodactylus mystaceus (Spix)

Plate 65a–c

1824. *Rana mystacea* Spix, p. 27, pl. 3, figs. 1, 3 (type locality, Bahia, Solimoēs).

1904. *Leptodactylus mystaceus.*—Méhely, 1904, p. 219, pl. 13, fig. 12.—L. Müller, 1922, p. 170.—Nieden, 1923, p. 487.—A. Lutz, 1924, p. 235; 1926b, pp. 147, 166, pl. 32, figs. 6, 7; 1930, pp. 10, 30.—Miranda-Ribeiro, 1926, p. 141.—Parker, 1928, p. 99; 1935, p. 509.—Crawford, 1931, p. 30.—Crawford and Jones, 1933, p. 89.— Mello-Leitão, 1937, p. 268.—Carvalho, 1939a, p. 280.—Dunn, 1940, p. 106.—Freiberg, 1942, p. 232.—Myers, 1946, pp. 10, 28.—B. Lutz, 1947, p. 247; 1948, p. 30; 1949b, p. 4; 1954, p. 157.—Lutz and Kloss, 1952, p. 641.—Cei, 1953, p. 517;

1955, p. 291; 1956, p. 47.—Cochran, 1955, p. 310.—Ginés, 1959, p. 114.—Gans, 1960, p. 304.—Rivero, 1961, p. 40.—Gorham, 1963, p. 19.

1912. *Leptodactylus longirostris* (not of Boulenger).—Baumann, 1912, p. 93 (specimens from the Organ Mountains, Rio de Janeiro).—Nieden, 1923, p. 488 (part).

Description.—USNM 147039, an adult from Florencia, Caquetá, Colombia. Vomerine teeth in two heavy, transverse, nearly continuous series behind the choanae; tongue three-fourths as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout acuminate when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout nearly as great as their distance from eye. Canthus rostralis distinct; loreal region flat, sloping to the upper lip. Eye large, prominent, its diameter 1⅓ times its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderate, with slightly swollen tips and lateral ridges, free, first finger longer than second and fourth, reaching to base of ultimate phalanx of third; a small thumb pad present; a distinct palmar callus; metacarpal tubercles well developed. Toes long, with slightly swollen disks and narrow fringes, third toe longer than fifth, its tip reaching to base of antepenultimate phalanx of fourth; tarsus granular; a small oval inner metatarsal tubercle and a smaller round outer one; no tarsal ridge; a heavy skinfold on heel and knee. Body elongate, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches anterior corner of eye; when limbs are laid along the sides, knee and elbow are separated; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts finely shagreened, with some heavier pustules on sacrum; a glandular dorsolateral fold from posterior border of eye almost to anus; a lateral glandular line from posterior tympanum to groin; venter smooth; a heavy glandular ridge from posterior corner of eye above tympanum, ending on shoulder; a skinfold across chest; a distinct ventral disk; external vocal sacs in the male.

Dimensions.—Head and body, 53 mm.; head length, 18 mm.; head width, 17.5 mm.; femur, 21.5 mm.; tibia, 26.5 mm.; foot, 28.5 mm.; hand, 11 mm.

Color in alcohol.—Dorsum chocolate; a darker reniform patch between upper eyelids and two or three irregular crescentic brown spots along center of back; a clove brown stripe beginning at tip of snout, widening on loreal region, and continuing along lower margin of each dorsolateral fold, and another outlining the tympanic ridge; upper limb surfaces drab, with three narrow brown crossbars on femur, widening on tibia, and becoming less distinct on foot; a pair of similar bars on forearm; posterior femur dark clove brown with a wavy cream buff diagonal line bisecting the dark area from about the midpoint of the femur and ending just above and behind the knee; a dark brown stripe along posterior arm surfaces, entire on forearm but broken on upper arm; anterior femur with a longitudinal row of small dark spots or a wavy dark line where the spots run together; sides of body olive, the tops of the granules and tubercles paler; venter ecru drab, immaculate except for a dark stripe around edge of lower jaw ending below gland at mouth commissure and for small dark spots on lower tibia and foot; side of head seal brown in loreal region, with a pale buff stripe along side of jaw to shoulder, dull brown between this stripe and edge of upper lip; palms and soles dull brown except for tubercles and tips of digits, which are dull buff.

Remarks.—This species is more closely allied to *L. poecilochilus poecilochilus* and *L. p. diptychus* than it is to *L. sibilatrix*, which in its most typical development has two pairs of distinct dorsal folds between the outer pair, while the forms of *L. poecilochilus* have smooth backs between the outer pair of folds.

L. mystaceus is distinguished from both forms of *L. poecilochilus* by having a sharply marked white streak along the upper lip, set off by darker areas from both the edge of the lip and the loreal region. Both forms of *L. poecilochilus* have spots on the lip.

The pale oval or diamond-shaped spot in the center of the back above the shoulders, very characteristic of *mystaceus*, sometimes is found in both forms of *L. poecilochilus* and it also occurs in *L. podicipinus petersi* and in *L. intermedius*. These five forms, plus *L. mystacinus*, which so far has not been found in Colombia, represent a "natural" grouping of forms with essentially similar body form, size, and color that differ in small but quite constant details.

Specimens Examined

COLOMBIA

Antioquia: Urabá, Río Curralao, CNHM 63847.

Caquetá: Florencia, USNM 147039–47; La Tagua, Tres Troncos, Río Caquetá, CNHM 69749.

Chocó: Sautata, Atrato, CNHM 74920 (2).

Meta: Acacías, USNM 147048–50; Cordillera Oriental up from Villavicencio, 1,100 m., Buena Vista, USNM 146435; Mouth of Caño Losada, USNM 150488–9; Caño Losada on upper Río Guayabero, USNM 146436; Villavicencio, 400 m., USNM 146433–4, 147396; Villavicencio, CNHM 81790–1.

Norte de Santander: Cúcuta, MLS 241; Río Zulia, USNM 147051–2.

Putumayo: Puerto Asís, MLS 239.

BRITISH GUIANA: Kartabo, USNM 118058.

Leptodactylus poecilochilus poecilochilus (Cope)

PLATE 63A–C

1862. *Cystignathus poecilochilus* Cope, 1862a, p. 156 (type locality, near Turbo [Antioquia], New Granada); 1862b, p. 357.

1882. *Leptodactylus poecilochilus*.—Boulenger, 1882a, p. 243; 1889, p. 247.—Cope, 1886b, p. 94.—Peracca, 1895, p. 27; 1897, p. 17.—Berg, 1896, pp. 150, 187.—Budgett, 1899, pp. 305, 307.—Baumann, 1912, p. 162.—Beebe, 1919, p. 209.—A. Lutz, 1930, pp. 13, 32.—Dunn, 1940, p. 106 (part).—Breder, 1946, p. 401.—Stebbins and Hendrickson, 1959, p. 529.—Rivero, 1961, p. 43.

Description.—USNM 4347a (holotype), an adult male from near Turbo, Antioquia, Colombia. Vomerine teeth in two heavy, transverse, arc-shaped, narrowly separated series on a level with posterior borders of choanae; tongue two-thirds as wide as mouth opening, ovate, its posterior border free and slightly notched; snout moderate in length, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis blunt; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter four-fifths its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum large, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers long, with faint lateral ridges, free, first finger longer than second and fourth, reaching to base of ultimate phalanx of third; a heavy oval thumb pad present; a distinct triangular palmar callus; metacarpal tubercles well developed. Toes long, third toe longer than fifth reaching to middle of antepenultimate phalanx of fourth; a small projecting inner metatarsal tubercle and a much smaller round outer one; a strong tarsal ridge, ending near heel; a strong skinfold on heel and knee. Body rather slender, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts pustular, with a wide dorsolateral ridge from posterior corner of eye to level of groin and a shorter lateral one from behind ear to groin; venter smooth, except for some granules on posterior femur; a sharp glandular ridge from posterior corner of eye above tympanum, ending in a widened gland behind tympanum; a distinct skinfold across chest; a prominent ventral disk; no external vocal sacs in the male.

Dimensions.—Head and body, 43 mm.; head length, 15 mm.; head width, 15.5 mm.; femur, 19 mm.; tibia, 22 mm.; foot, 21 mm.; hand, 9.5 mm.

Color in alcohol.—The type has faded to nearly cream-buff, but some faint sepia lines still emphasize the dorsolateral fold from behind the eye to the level of the groin, while on the posterior femur a row of light spots surrounded by sepia outlines may still be seen. It appears to have had a paler middorsal stripe. The venter is pale olive-buff.

Remarks.—In a series consisting of five frogs from Costa Rica, seven from Panama, and the type from Turbo in Antioquia, the critical measurements overlap with those of Colombian *L. poecilochilus diptychus* except for hand length. Nominate *L. poecilochilus* has a slightly shorter hand proportionately than does *L. p. diptychus* (twice standard error for *L. p. poecilochilus* extends from 22.1 to 23.5 percent of the head-body length, and for *L. p. diptychus* from 23.6 to 25 percent, with a gap of only 0.1 percent). The examination of a larger series of both forms is necessary before giving weight to the hand length as a character for separating these two forms.

While nominate *poecilochilus* and *L. p. diptychus* are undoubtedly very closely related, minute average differences tend to keep them separate. The slightly wider and sharper postfemoral light line of the former is seldom duplicated in the latter, in which a series of light spots sometimes is the only remaining evidence of such a marking. The dark canthal stripe apparently reaches the anterior margin of the eye in most specimens of *poecilochilus* but is sometimes interrupted in *L. p. diptychus*. The distinct spotting of upper lip and back seems to be partly a matter of the preservation and age of the specimen, as in 25 freshly collected examples of *L. p. diptychus* from Río Manso, Córdoba, the back is spotted in 70 percent and the upper lip in 50 percent, the spots equaling in intensity those of the best-preserved specimens of *L. poecilochilus* from Panama. Unfortunately, the type of *L. poecilochilus* is now completely faded, although the original description mentions the "brown band on the extremity of each canthus rostralis reaching the labial commissure; another beneath the anterior part of the orbit. Lips marbled with white and brownish"; and, further on, in comparing this species with *fuscus*, Cope speaks of its "want of spots on the back," as he had just stated that the color of the superior surface of *L. poecilochilus* was chestnut brown. Rivero (1961, p. 43) believes that *poecilochilus* is more spotted on the dorsum than *L. p. diptychus*, in spite of Cope's statement about the type. Much more comparison of fresh specimens from lower Central America and northern South America is needed before the true status of either form can be established.

Specimens Examined

COLOMBIA

Antioquia: Near Turbo, USNM 4347a (type); Medellín, AMNH 38829.

BRAZIL: Pará to Manaos, USNM 28930.

COSTA RICA: Pazo Azul de Pirris, MCZ 7997–8001.
PANAMA: Gatún, Canal Zone, USNM 54177; Progreso, Chiriquí, USNM 118673; Parita, Herrera, USNM 127261; Cerro Campana, USNM 139701; Mojara, USNM 129841–4.

Leptodactylus poecilochilus diptychus Boulenger

Plate 63d–f

1918. *Leptodactylus diptychus* Boulenger, p. 431 (type locality, Andes of Venezuela).—A. Lutz, 1927, pp. 39, 45, pl. 10, figs. 12, 13.—Shreve, 1947a, p. 535.—Ginés, 1959, p. 114.—Stebbins and Hendrickson, 1959, p. 529.
1961. *Leptodactylus poecilochilus dypticus.*—Rivero, 1961, p. 42; 1963a, p. 93; 1964b, p. 311.
1963. *Leptodactylus dypticus.*—Gorham, p. 19.

Description.—USNM 146437 an adult from Villa Arteaga, Antioquia, Colombia. Vomerine teeth in two heavy, transverse, arc-shaped, nearly contiguous series behind the choanae; tongue three-fourths as wide as mouth opening, cordiform, its posterior border free and distinctly notched; snout acute, but rounded at the tip when viewed from above, rounded in profile, the upper jaw extending considerably beyond the lower. Nostrils dorsolateral, distinctly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis indistinct; loreal region concave, sloping outward to the upper lip. Eye large, prominent, its diameter three-fifths its distance from tip of snout; interorbital diameter a little wider than that of upper eyelid, equal to interval between nostrils. Tympanum large, its greatest diameter three-fourths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers long, scarcely webbed but with prominent lateral ridges, first finger much longer than second or fourth and reaching almost to base of ultimate phalanx of third; a heavy oval thumb pad present; a distinct cordiform palmar callus; metacarpal tubercles well developed. Toes with small webs, third toe much longer than fifth, its tip reaching to center of antepenultimate phalanx of fourth; a narrow but heavy inner metatarsal tubercle and a very small round outer one; a heavy tarsal ridge, ending just before heel; a distinct skinfold on heel and knee. Body rather slender in postaxillary region, narrower than greatest width of head. When hind leg is adpressed, heel reaches a point between eye and nostril; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts pustular and shagreened, with a heavy dorsolateral fold from behind eye to groin, and a shorter fold from above arm insertion to groin; venter smooth on chin, chest, and belly; coarse granules on lower femur; a thick glandular ridge from posterior corner of eye above tympanum, ending behind it; another shorter ridge from corner of mouth to shoulder; a distinct skinfold across chest; a heavy ventral disk; probably external vocal sacs in the male.

Dimensions.—Head and body, 46 mm.; head length, 16.5 mm.; head width, 16 mm.; femur, 20.5 mm.; tibia, 24.5 mm.; foot, 23 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum vandyke brown, with a wide clove brown chevron between the eyes and with irregular marblings of clove brown on back and sacrum; upper surface of limbs wood brown with sepia crossbars, three of these on the upper tibia alternating with much smaller bars and all ending in a clove brown spot on concealed surface of tibia; posterior femur wood brown with a narrow but sharply defined light stripe from near anus to under knee, bordered above and below by clove brown; venter immaculate pinkish buff; side of head wood brown with several squarish sepia spots nearly reaching edge of lip, one or two of these touching lower eyelid; central part of canthus rostralis with a wide clove brown stripe followed by a light space, and then by two small clove brown spots just in front of eye; a clove brown stripe covering the glandular ridge which emanates from the posterior corner of eye and ends behind tympanum; lower surfaces of hands and feet wood brown, the tubercles pale ecru drab.

Remarks.—The adpressed heel reaches the anterior corner of eye or to a point between the eye and the nostril in about two-thirds of the examples at hand; it reaches the center or posterior corner of eye in the remainder. The tarsus is granular to warty in slightly over half the examples, and smooth or nearly so in the others. As these differences are not correlated with geographic distribution, they must be regarded as random or individual variations.

There are no distinctive stripes on any of the Colombian specimens of *L. poecilochilus diptychus* at hand. According to Rivero (1961, p. 43), the distinctive stripes are characteristic of Costa Rican frogs of the nominate form. Cope's type of *poecilochilus* (USNM 4347a from near Turbo, Antioquia, Colombia) is completely faded now; otherwise, it is in fair condition. More fresh material of both forms is needed in order to clarify their relationships.

Specimens Examined

COLOMBIA

Antioquia: Villa Arteaga, USNM 146437–8; Urabá, Río Currulao, CNHM 63846.

Bolívar: Isla Fuerte, CNHM 74937 (part).

Caquetá: Florencia, MLS 273.

Córdoba: Río Manso, tributary to upper Río Sinú, USNM 150134–58.

Guajira: One-half mi. south of Pajaro, USNM 151306.

Magdalena: Fundación, USNM 102408–10, BM 1916.4.4.16–7; Río Frío MCZ 16069; Santa Marta Mountains, BM 1929.11.12.5–8.

Nariño: Río Satinga, USNM 147486.

Norte de Santander: Cúcuta, ANSP 21033; La Selva Hacienda, 3 km. south of Cúcuta, MLS 301; Río Zulia, USNM 147070–3, 147074–5 (20 km. west of Cúcuta).

Tolima: Espinal, MCZ 15065–6, 15069–70, 15072–5.

VENEZUELA: Falcón: Pauy, Acosta District, MCZ 25889–90.

Leptodactylus rubido Cope

Plate 62d–f

1874. *Leptodactylus rubido* Cope, 1874b, p. 128 (type locality, Moyabamba, Peru).—Barbour and Noble, 1920, p. 611.—Nieden, 1923, p. 480.—Barbour and Loveridge, 1929, p. 293.—A. Lutz, 1930, pp. 12, 31.—Goin and Layne, 1958, p. 100.—Gorham, 963, p. 19.

1884. *Leptodactylus rubidus.*—Boulenger, 1884, p. 637.

1913. ?*Leptodactylus rubido.*—Stejneger, 1913, p. 544.

Description.—USNM 147466, an adult female from Imbilí, Río Mira, Nariño, Colombia. No bony ridges on top of head. Vomerine teeth in two heavy, transverse, arc-shaped series behind the choanae; tongue more than one-half as wide as mouth opening, obovate, its posterior border free and deeply notched; snout moderately long, rounded when viewed from above, slanting forward to the labial rim in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout two-thirds their distance from eye. Canthus rostralis broad and blunt; loreal region concave, sloping outwards to the upper lip. Eye large, prominent, its diameter slightly less than its distance from tip of snout; interorbital diameter 1¼ times that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to two-thirds its own diameter. Fingers slender, long, with faint lateral ridges, free, first finger much longer than second or fourth and reaching beyond base of terminal phalanx of third; an elongate thumb pad present; a flat, heart-shaped palmar callus; metacarpal tubercles well developed.Toes fairly long, unwebbed, third toe longer than fifth, its tip reaching halfway on antepenultimate phalanx of fourth; a small but distinct inner metatarsal tubercle and a smaller round outer one; a sharp tarsal ridge, ending just before reaching heel; a heavy skinfold on heel and knee. Body stout, in postaxillary region less than greatest width of head. When hind leg is adpressed, heel reaches to anterior border of tympanum; when limbs are laid along the sides, knee and elbow barely touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts nearly smooth anteriorly, pustular posteriorly and on sides; venter smooth; tarsus with a few scattered pustules; a heavy dorsolateral fold extending from posterior corner of eye to level of groin; a pair of less distinct lateral folds; a weak glandular ridge from posterior corner of eye above tympanum, ending behind it, and another behind angle of mouth; a distinct skinfold across chest; a ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 51.5 mm.; head length, 18 mm.; head width, 18 mm.; femur, 18.5 mm.; tibia, 21 mm.; foot, 20.5 mm.; hand, 12.5 mm.

Color in alcohol.—Back dull drab, with an indistinct blackish slate interorbital triangular patch and vague longitudinal markings on each side of the midline; dorsolateral folds sharply outlined by black below, this color fading out on the sides; two rounded black spots on loreal region, a crescentic black mark around anterior half of lower eyelid, and a wide black stripe from posterior part of lower eyelid through tympanum and ending above shoulder; four irregular black spots along border of upper lip; a white line marking the short gland behind commissure of mouth; venter pale buff, the throat and chest very heavily reticulated with sepia, and some large sepia spots down center and sides of belly; upper surface of limbs olive with three or four moderately wide clove brown crossbars; anterior femur dull wood brown suffused with small sepia spots; posterior femur sepia with a few small lighter and darker spots; palms of hands and soles of feet clove brown, the tips of the digits olive-buff.

Remarks.—USNM 147480 consists of 20 just-metamorphosed young, of which the smallest individual, with no vestigial tail, measures 13.5 millimeters in head-and-body length. The 13 adults in the series USNM 147457–69 range from 44 to 55 millimeters in head-and-body length. No trace of thumb or chest spines is apparent in any of the males.

The above-described Colombian specimen agrees with the type of *L. rubido* (MCZ 4780, an adult male from Moyabamba, Peru) except in a few minor details. Analysis of the critical measurements shows that *rubido* has a shorter foot proportionately than any other Colombian frog of the genus, while the femur and tibia also are quite short. A paratype of *curtus* Barbour and Noble (now USNM 75990, from Bellavista, Peru) has similar proportions, and it may be that additional Peruvian examples will prove the two to be conspecific.

L. rubido can be confused with young specimens of *L. pentadactylus*, as the heavy build and dark spotting on legs are quite similar. But the latter grows to a much greater size (around 190 mm. total length, as contrasted with probably less than 100 mm. for *rubido*); also, the dorsolateral folds extend to the level of the groin in *rubido* and to the sacrum in *pentadactylus*.

Specimens Examined

COLOMBIA
Amazonas: Leticia, UF 10018.
Boyacá: Muzo, USNM 147076.
Cundinamarca: La Mesa, 1,000–1,300 m., USNM 144892–3.
Nariño: Imbilí, Río Mira, USNM 147457–80; Río Satinga, USNM 147483–5; North of Tumaco, Río Rosario, USNM 147488–9 (juv.).
Valle: Buenaventura, USNM 147077–8.
PERU: Cuzco: Río Comberciato, near head of Río Urubamba, USNM 60755; San Miguel, USNM 49553. Huanuco: Hacienda Pompayaco, MCZ 22823–7; Sinchona, JP 301. San Martín: Moyabamba, MCZ 4780 (holotype); Tocache, Río Huallaga, JP 645.

Leptodactylus sibilatrix (Wied)

Plate 64d–f

1802. *Rana typhonia* (not of Linnaeus).—Daudin, 1802, p. 106, pl. 17, figs. 3, 4; 1803, p. 106, pl. 95, figs. 1, 2.—Andersson, 1900, p. 25.
1824. *Rana pachypus* Spix (part), p. 26, pl. 3, fig. 2 (specimen from Pará).—Wied, 1825, p. 540.
1824. *Rana sibilatrix* Wied, 1824b, col. 671 (type localities, Rio Peruhypa [Peruipe?], near Villa Viçoza, and Rio Mucuri, Brazil); 1824a, pl. [47], fig. [2]; 1825, pp. 545, 606.
1824. *Rana mystacea* Spix (part), p. 27, pl. 3, figs. 1–3 (type localities, Bahia, Solimoẽs).—Peters, 1873a, p. 201.
1826. *Leptodactylus typhonia*.—Fitzinger, 1826, p. 64.
1826. *Leptodactylus sibilatrix*.—Fitzinger, 1826, p. 64.—Parker, 1935, p. 509.—Freiberg, 1942, p. 232.—Stebbins and Hendrickson, 1959, p. 535.—Ginés, 1959, p. 114.—Gans, 1960, p. 306.—Cei and Roig, 1961, p. 21.—Rivero, 1961, p. 44; 1964a, p. 298; 1964b, p. 311.—Bokermann, 1962a, p. 216.
1830. *Cystignathus mystacea*.—Wagler, 1830, p. 203 (part).
1830. *Cystignathus typhonia*.—Wagler, 1830, p. 203.
1830. *Cystignathus sibilatrix*.—Wagler, 1830, p. 203.
1838. *Cystignathus ocellatus*.—Tschudi, 1838, p. 78 (part).
1841. *Cystignathus typhonius*.—Duméril and Bibron, 1841, p. 402 (part).—Reinhardt and Lütken, 1862, p. 164.—Steindachner, 1867, p. 24.—Peters, 1876, p. 709.
1848. *Cystignathus schomburgkii* Troschel, p. 659 (type locality, British Guiana).
1858. *Cystignathus gracilis* (not of Duméril and Bibron).—Günther, 1858, p. 28.—Hensel, 1867, p. 130.
1882. *Leptodactylus typhonius*.—Boulenger, 1882a, p. 246; 1898b, p. 131; 1903b, p. 69.—Boettger, 1892, p. 31.—Berg, 1896, pp. 150, 184.—Peracca, 1897, p. 17.—Budgett, 1899, pp. 305, 306.—Schnee, 1900, p. 464.—Brandes and Schoenichen, 1901, p. 403.—Méhely, 1904, p. 222.—Andersson, 1906, p. 9.—Baumann, 1912, p. 94; 1917, p. 139.—Ruthven, 1919, p. 3; 1922, p. 54.—Beebe, 1919, p. 209.—Nieden, 1923, p. 486.—A. Lutz, 1924, p. 235; 1926b, pp. 146, 165, pl. 32, figs. 1–3, pl. 33, figs. 1, 2; 1927, pp. 39, 46, pl. 12, figs. 21, 22; 1930, pp. 14, 32.—Miranda-Ribeiro, 1926, p. 145, fig. 77; 1927, pp. 114, 127; 1937a, p. 56.—De Witte, 1930, p. 225.—Crawford, 1931, p. 30.—Ahl, 1931b, p. 3 in separate, photograph.—Eisentraut, 1932, p. 317.—Parker, 1934b, p. 123.—Schubart, 1939, p.

54.—Schmidt and Inger, 1951, p. 446.—B. Lutz, 1954, p. 157.—Goin, 1959a, p. 139.—Gorham, 1963, p. 19.

1927. *Leptodactylus sibilator.*—L. Müller, 1927, p. 281.—Müller and Hellmich, 1936, p. 51, fig. 18.—Mertens, 1937, p. 144.—Hellmich, 1939, p. 391.—Vellard, 1948, p. 165.—B. Lutz, 1954, pp. 177, 228.

1936. *Leptodactylus plaumanni* Ahl, p. 389 (type locality, Nova Teutonia, Santa Catarina, Brazil).

1953. *Leptodactylus sybirator.*—Cei, 1953, p. 512.

1953. *Leptodactylus sybilator.*—Cei, 1953, p. 517; 1955, p. 291.

1961. *Leptodactylus sybilatrix.*—Gallardo, 1961b, p. 34.

Description.—USNM 147093, an adult male from Mariquita, Tolima, Colombia. Vomerine teeth in two transverse, crescentic, nearly continuous series behind the choanae; tongue two-thirds as wide as mouth opening, broadly oval, its posterior border free and deeply notched; snout long, rounded when viewed from above, but with a ridge around lip border so that in profile the upper jaw appears more or less acuminate and extends considerably beyond the lower. Nostrils dorsolateral, scarcely projecting, their distance from end of snout almost equal to their distance from eye. Canthus rostralis distinct; loreal region nearly flat, sloping to the upper lip. Eye large, prominent, its diameter nearly as great as its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum large and distinct, its greatest diameter three-fifths that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers short, with lateral ridges, free, first finger longer than second or fourth, reaching to base of ultimate phalanx of third; an oval thumb pad present; a large partly divided palmar callus; metacarpal tubercles well developed. Toes very long, not webbed, third toe much longer than fifth and reaching beyond base of antepenultimate phalanx of fourth; tarsus smooth; an oval inner metatarsal tubercle; outer metatarsal tubercle very small, almost invisible; a heavy tarsal ridge, ending at heel; a heavy skinfold on heel and knee. Body elongate, in postaxillary region smaller than greatest width of head. When hind leg is adpressed, heel reaches nostril; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap greatly. Skin of upper parts minutely pustular; a pair of glandular lateral folds, and between them three other pairs of folds which sometimes break up into rows of elongate glands; venter smooth; a heavy skinfold across chest; a ventral disk; a pair of external lateral vocal sacs in the male.

Dimensions.—Head and body, 54 mm.; head length, 18 mm.; head width, 17.5 mm.; femur, 23.5 mm.; tibia, 30.5 mm.; foot, 29 mm.; hand 11.5 mm.

Color in alcohol.—Dorsum wood brown; a wide middorsal pale buff stripe from snout tip to vent; the longitudinal glandular ridges beside this stripe as well as some parts of the dorsolateral ridge clove brown, with some irregular sepia spots on both sides of the latter; upper limb surfaces drab, with five alternately narrow and wide sepia crossbands on tibia, femur, and foot; upper arm ecru drab, with two or three faint darker bands; posterior femur drab with an irregular clove brown network, and a much broken diagonal light line from its midpoint to behind knee; anterior femur ecru drab with dark spots arranged in a wide irregular longitudinal stripe; venter ecru drab, immaculate except for a dark brown line around lower jaw, ending in a dark patch covering external vocal sacs and a few dark spots below tibia and foot; side of head ecru drab, except a slightly paler line along rim of upper jaw, with a darker suffusion towards the outer edges.

Variation in distinctness of dorsal folds is quite wide. Some specimens have the backs practically smooth (possibly the result of mode of preservation); others have the outer pair distinct and the two inner pairs scarcely apparent; and still others have all three pairs very well developed.

Color is also variable. Many specimens have a wide pale middorsal stripe. Those without such a stripe have five rather irregular dark transverse bars between shoulders and anus; often these bars are broken up into several large spots that lose their transverse arrangement and become scattered over the posterior half of the back.

The white stripe along the upper lip and the postfemoral white stripe or row of white dots are characteristic both of *Leptodactylus sibilatrix* and of its ally *L. mystaceus*. The frogs of the latter species, however, do not have more than one pair of dorsal folds (which actually are dorsolateral in position) and the males lack the black lateral throat sacs so obvious in *sibilatrix*.

Specimens Examined

COLOMBIA

Amazonas: Leticia, USNM 140289.

Antioquia: Casabe, USNM 147079; near Turbo, Golfo de Urabá, USNM 150491–515; Sonsón, MLS 243, AMNH 22609; Villa Arteaga, CNHM 78141.

Bolívar: Río Viejo, lower Río Magdalena, USNM 145777–9.

Córdoba: Tierra Alta, 70 m., CNHM 61806.

Cundinamarca: Beltrán on Río Magdalena, USNM 145743; Cambao, USNM 147080–2; Puerto Salgar, MLS 279; Tocaima, MLS 295.

Magdalena: Fundación, MCZ 8968–9; Ciénaga, USNM 144159–60.

Meta: Near Puerto López, upper Río Meta on the Pacicuará, USNM 146197–9; Macarena and El Mico, upper Río Güejar, USNM 144894; Villavicencio, USNM 144895, 147083–7, 147397–8; Granada on Río Ariari, south of Villavicencio, USNM 151495–503; Menegua, east of Puerto López, upper Río Meta, USNM 147275; San Juan de Arama, 400 m., Los Micos, CNHM 81330–1.

Norte de Santander: Astillero, USNM 147088–9, MLS 216; Río Catatumbo, USNM 145088–92; La Selva, MLS 215; Río Zulia, 15 km. north of Astillero, USNM 147090.

SANTANDER: El Centro, USNM 144839–42, 147091–2, CNHM 81760; Puerto Wilches, USNM 142805.

TOLIMA: Espinal, MLS 111, 111a; Honda, MLS 117; Mariquita, USNM 144896–900, 147093–4, 150516–9; Mesa Cucuana, USNM 145093.

VAUPÉS: Cerro Yapoboda, Río Cuduyari, USNM 146432.

VENEZUELA: Salamanca, Margarita Island, USNM 137346.

Leptodactylus intermedius A. Lutz

PLATE 64A–C

1930. *Leptodactylus intermedius* A. Lutz, pp. 18, 27, pl. 3, fig. 3 (type locality, Manacapurú, near Manáos, Amazonas, Brazil).—Lutz and Kloss, 1952, p. 639.—Goin, 1959, p. 136.—Gorham, 1963, p. 19.

1958. *Leptodactylus intermedius intermedius*.—Goin and Layne, p. 99.

Description.—UF 8544-2, an adult male from Leticia, Amazonas, Colombia. Vomerine teeth in two heavy, triangular, narrowly separated series behind the choanae; tongue two-thirds as wide as mouth opening, nearly oval, its posterior border free and distinctly notched; snout moderately long, rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, slightly projecting, their distance from end of snout about two-thirds their distance from eye. Canthus rostralis distinct; loreal region flat, vertical, sloping outward to the upper lip. Eye large, prominent, its diameter about five-sixths its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum distinct, its greatest diameter two-thirds that of eye, separated from eye by an interval equal to one-fourth its own diameter. Fingers moderately long, their tips not enlarged, with lateral ridges, free, first finger longer than second, fourth shorter than either, tip of first reaching midway on penultimate phalanx of third; a prominent oval thumb pad present, and, in the male, a black-tipped spine on pad and another below basal metacarpal tubercle; a slightly larger rounded palmar callus; metacarpal tubercles large and well developed. Toes long, webbed at the base, with wide dermal fringes, third toe much longer than fifth, its tip reaching halfway on antepenultimate phalanx of fourth; a small oval inner metatarsal tubercle and a smaller round outer one; tarsus not granular; a heavy tarsal ridge, ending just before reaching heel; a distinct skinfold on heel and knee. Body fairly stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels slightly overlap. Skin of upper parts shagreened with minute pustules; a short glandular ridge above the shoulder, and some larger glandules along the sides; venter smooth except for transverse ridges across middle of belly and coarse granules on posterior and lower surfaces of femur; some low glands along side of belly behind axilla; a pronounced glandular ridge from posterior corner of eye above tympanum, ending just above the large gland at mouth commissure; no skinfold across chest; no ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 44 mm.; head length, 15.5 mm.; head width, 15 mm.; femur, 18.5 mm.; tibia, 20.5 mm.; foot, 22 mm.; hand, 11.5 mm.

Color in alcohol.—Dorsum sepia; a pale drab crossbar between the eyes, outlined by narrow darker lines; snout in front of these darker lines pale olive; a small oval olive spot in center of back between the shoulders; upper limb surfaces light sepia to drab, with three indistinct, slightly darker crossbars that are much broken up on the upper femur and foot; similar but very indistinct bars on arms. Sides of body olive buff with small gray punctulations, the lateral glands clove brown. Venter pale buff, with a very fine drab reticulation over throat and part of chest; lower limb surfaces also spotted or reticulated with drab. Side of head drab, with a paler vertical line at tip of snout and three or four diagonal light lines along the tip separating the dark area into squarish or rhomboidal spots. Posterior femur below the crossbars (already mentioned) has the lower half clove brown, with a buff line from near each side of vent in a slightly diagonal direction to back of knee. Anterior femur olive-buff with faint gray marblings on upper part, immaculate below. Gland at mouth commissure and glands from axilla nearly to groin, ochre yellow. Posterior femoral glands (on each side of anus) clove brown.

Remarks.—Two half-grown frogs (USNM 103621–2, from Manacapurú, Amazonas, Brazil) that measure 31 and 25.5 millimeters, respectively, already show the yellow coloring on the large gland behind the mouth commissure and on the glands along the sides of the belly. It is possible that these two specimens are cotypes of *L. intermedius* A. Lutz, as they were given to the United States National Museum by Dr. Lutz in 1935, having been collected by William Erhardt on June 24, 1925, and September 7, 1924. It is apparent that these specimens are not adults as Dr. Lutz thought.

The largest male at hand (USNM 146252) measures 50 millimeters, a length that is approached by a female (USNM 142187) measuring 48.5 millimeters.

The light stripe on the posterior femur is distinct, although sometimes irregular, in about two-thirds of the 20 examples examined; it is indistinct or absent in the others. The tarsus is smooth in 14 of the specimens, faintly granular in four, and pustular in two.

The males do not always have thumb spines in evidence, but the yellow glands from the mouth nearly to the groin are almost always apparent, especially in freshly caught individuals.

Specimens Examined

COLOMBIA

Amazonas: Leticia, UF 8541, 8542-1-2, 8543, 8544-1-3, 8545, USNM 142187-94, 146252, 147031.

BRAZIL: Manacapurú, Amazonas, USNM 103621-2.

Leptodactylus podicipinus petersi (Steindachner)

Plate 64g-i

1864. *Platymantis petersii* Steindachner, p. 254, pl. 16, figs. 2, 2a-c (type locality, Marabitanas, Brazil).

1903. *Leptodactylus caliginosus* (not of Girard).—Boulenger, 1903, p. 481.—A. Lutz, 1927, pp. 39, 45, pl. 11, figs. 14, 15.—Shreve, 1947a, p. 536.

1952. *Leptodactylus sp.* (near *petersii*).—Aleman, 1952, p. 26.

1958. *Leptodactylus podocipinus.*—Goin and Layne, 1958, p. 98.

1959. *Leptodactylus podicipinus* (not of Cope).—Stebbins and Hendrickson, 1959, p. 533.

1959. *Leptodactylus petersi.*—Goin, 1959, p. 136.—Ginés, 1959, p. 114.

1961. *Leptodactylus podicipinus petersii.*—Rivero, p. 47; 1963a, p. 93; 1964a, p. 298; 1964b, p. 311.

Description.—USNM 147064, an adult male from La Selva, Norte de Santander, Colombia. Vomerine teeth in two heavy, transverse, narrowly separated series behind the choanae; tongue one-half as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout moderate, rounded when viewed from above and in profile, the upper jaw extending well beyond the lower. Nostrils more dorsal than lateral, projecting slightly, their distance from end of snout two-thirds their distance from eye. Canthus rostralis not distinct; loreal region slightly concave, sloping to the upper lip. Eye large, prominent, its diameter three-fourths its distance from tip of snout; interorbital diameter a little greater than that of upper eyelid, equal to inteval between nostrils. Tympanum distinct, its greatest diameter five-sixths that of eye, separated from eye by an inteval equal to one-third its own diameter. Fingers moderate, with faint lateral ridges, slightly webbed at base, first finger a little longer than second and fourth, reaching to base of ultimate phalanx of third; a pair of heavy black-tipped thumb spurs in the male; a small palmar callus; metacarpal tubercles well developed. Toes long, fringed, webbed at the base, third toe longer than fifth, reaching halfway on antepenultimate phalanx of fourth; a small but distinct inner metatarsal tubercle and an outer one nearly the same in size; a heavy tarsal ridge, ending at heel; a heavy skinfold on heel and knee. Body rather stout, in postaxillary region nearly equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of eye; when limbs are laid along the sides, knee and elbow touch; when hind legs are bent at right angles to body, heels overlap. Skin of upper parts coarsely glandular, with small pustules along edge of upper eyelids, on dorsolateral region, and especially on the sacrum; venter smooth; a distinct glandular ridge from posterior corner of eye forking above tympanum, its lower branch ending above corner of mouth, its upper branch continuing as a pustular interrupted lateral line; a faint skinfold across chest; no ventral disk; small external lateral vocal sacs and a pair of thunb spines in the male.

Dimensions.—Head and body, 46.5 mm.; head length, 15.5 mm.; head width, 16 mm.; femur, 19.5 mm.; tibia, 23 mm.; foot, 26 mm.; hand, 12 mm.

Color in alcohol.—Dorsum slate gray, lightening to olive gray posteriorly and on limbs; a slate black triangle between the eyes, its apex pointed backwards; a slate chevron between the shoulders, and short indistinct slate stripes following the lines of glandules on back; femur with four short black crossbars, continued across tibia and becoming fainter on outside of foot; similar but paler bars on forearm; posterior femur pale drab gray with short black spots arranged longitudinally on both sides of a median light postfemoral stripe; sides of body smoke gray, lightening to olive buff towards the belly; sides of head smoke gray, with three or four large diagonal black spots from eye and loreal region to edge of lip; venter pinkish buff, immaculate except for some gray spots around lower lip borders, and gray suffusions on throat (of male).

Remarks.—Metamorphosis was complete in a froglet (one of 19 specimens collected by the late Dr. E. R. Dunn at Villavicencio in Meta) only 11.5 millimeters long. The yellow lateral glands are not yet noticeable at so young an age but they are very distinct in young males that measure 29 millimeters.

In comparing critical measurements of 62 specimens of *L. podicipinus petersi* from the northern countries of South America with 19 specimens of the nominate form from Bobore, Bolivia, and Pastorca, Paraguay, the tibia in the former group was found to be significantly longer proportionately than in the latter group. The foot of *L. podicipinus petersii* also was longer, although the gap between the groups was not great in this respect.

The largest male of *L. podicipinus petersi* measured 63.5 millimeters and the largest female in that group measured 62.5 millimeters, while the largest male of *L. podicipinus podicipinus* measured 38.5 millimeters and the largest female 43 millimeters.

The longer femur mentioned by Rivero (1961, p. 48) as characteristic of *L. podicipinus petersi* was not apparent in the specimens measured. The measurements of head width also overlapped in the two groups.

The light postfemoral stripe may be present, broken, or absent in both forms. It was present as an unbroken stripe in only one of the 19 specimens of *L. podicipinus podicipinus* but was quite apparent in 33 of the 62 specimens of *L. p. petersi* measured.

Specimens Examined

COLOMBIA
  Amazonas: Leticia, USNM 142179–86, UF 8537–40.
  Antioquia: Medellín, AMNH 38785, 38808–15, 39465; Envigado, AMNH 39265, 39274, 39281.
  Bolívar: Alto de Quimarí, 500 m., Sinú River side, CNHM 61752.
  Boyacá: Muzo, 900 m., CNHM 69744.
  Cundinamarca: Anolaima, near Bogotá, AMNH 13471, USNM 147054–5; Sasaima, MLS 235; Beltrán, upper Río Magdalena, USNM 147254; Girardot, USNM 146467.
  Meta: Up from Buenavista, Cordillera Oriental, 1,100 m., USNM 144867–82; Granada on Río Ariari, south of Villavicencio, USNM 151494; Menegua, east of Puerto López, upper Río Meta, USNM 147273–4; Villavicencio, CNHM 81788–9, MLS 88, 94, 99, 234, USNM 144848–55, 147056–62; 7 km. northeast of Villavicencio, USNM 146382–4.
  Nariño: Río Mataje, USNM 147393–5.
  Norte de Santander: Astillero, USNM 147063; La Selva, USNM 147064–9; Tibú, MLS 200.
  Santander: El Centro, USNM 144838–42; Girón territory, near Lebrija, USNM 144883–8; Lagos de Cacique, 4.7 km. southeast of Bucaramanga, USNM 146250; San Gil, MLS 238, CM 7938.
  Valle: Two km. south of Cali, USNM 148800–23; Virology Field Station, Río Raposo, USNM 151463.
TRINIDAD: Upper Tucker Valley, USNM 119055–60.
VENEZUELA: Caripito, USNM 117088–9; Mérida, USNM 118176; Patare, Miranda, USNM 121147.

Genus *Lithodytes* Fitzinger

1843. *Lithodytes* Fitzinger, p. 31 (type species, *Hylodes lineatus* Duméril and Bibron).

Generic diagnosis.—Pupil horizontal. Tongue oval, rounded and free behind. Vomerine teeth present. Tympanum distinct. Fingers and toes free, broadened at the tip, with T-shaped bony terminal phalanges. Web not separating the fourth and fifth toes. Omosternum and sternum with a bony style and a cartilaginous plate. Transverse diapophysis of sacral vertebra weakly broadened.

Lithodytes lineatus **(Schneider)**

Plate 65d–f

1799. *Rana lineata* Schneider, p. 138 (type locality not given).—Shaw, 1802, p. 128.—Gravenhorst, 1829, p. 44, pl. 8, fig. 2.

1802. *Rana castanea* Shaw, p. 128 (type locality, Surinam).
1802. *Bufo lineatus.*—Daudin, 1802, p. 105; 1803, p. 188.
1803. *Bufo albonotatus* Daudin, p. 185 (type locality, Surinam).
1820. *Rana schneideri* Merrem, p. 177 (type locality not given).
1841. *Hylodes lineatus.*—Duméril and Bibron, 1841, p. 625.—Günther, 1858, p. 91 (part); 1859a, p. 89; 1901, p. 241.—Brocchi, 1879, p. 22; 1881, p. 59.—F. Müller, 1882b, p. 167.—Boulenger, 1882a, p. 207.—Brandes and Schoenichen, 1901, p. 12.—Despax, 1911, p. 40.
1843. *Lithodytes lineatus.*—Fitzinger, 1843, p. 31.—Cope, 1862a, p. 154.—Peracca, 1904, p. 31.—Ruthven, 1919, p. 4.—Nieden, 1923, p. 468.—Parker, 1934c, p. 266.—Dunn, 1944c, p. 511.—Stebbins and Hendrickson, 1959, p. 536.—Ginés, 1959, p. 114.—Rivero, 1961, p. 52.—Gorham, 1963, p. 19.
1890. (?)*Hylodes* sp.—Wolterstorff, 1890, p. 317.
1919. *Leptodactylus lineatus.*—Beebe, 1919, p. 208; 1925, p. 125.—Crawford, 1931, p. 29.—Parker, 1935, p. 507.

Description.—USNM 147096, an adult female from La Selva, Norte de Santander, Colombia. Vomerine teeth in two short, transverse, narrowly separated series behind the choanae; tongue two-thirds as wide as mouth opening, broadly oval, its posterior border free and scarcely notched; snout moderate, rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils lateral, not projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis not distinct; loreal region slightly convex, sloping outward to the upper lip. Eye large, prominent, its diameter two-thirds its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between the nostrils. Tympanum large, distinct, its greatest diameter nearly equal to that of eye, separated from eye by an interval equal to one-third its own diameter. Fingers moderate, with lateral ridges, free, first finger much longer than second or fourth, its tip reaching nearly to base of last phalanx of third; all fingers and toes with very small bulbous disks; a large oval thumb pad present; a flat palmar callus; metacarpal tubercles well developed. Toes long, free, third toe longer than fifth, its tip reaching almost to base of antepenultimate phalanx of fourth; a heavy oval inner metatarsal tubercle and a smaller round outer one; a trace of a tarsal ridge just behind the inner metatarsal tubercle; a skinfold on heel and knee. Body stout, in postaxillary region narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow overlap; when hind legs are bent at right angles to body, heels strongly overlap. Skin of upper parts roughly shagreened anteriorly to finely tubercular on sacrum and upper tibia; venter smooth, except for many fine transverse folds across anterior belly; a weak glandular ridge from posterior corner of eye above and behind tympanum, ending at arm insertion; a faint skinfold across chest; traces of a ventral disk; no external vocal sac.

Dimensions.—Head and body, 54 mm., head length, 16.5 mm.; head width, 17.5 mm.; femur, 21.5 mm.; tibia, 25 mm.; foot, 21.5 mm.; hand, 12 mm.

Color in alcohol.—Dorsum clove brown anteriorly to seal brown posteriorly; a pair of wide clay-colored dorsolateral stripes beginning on tip of snout and continuing along edge of upper eyelid, above shoulder, and along sides nearly to groin; a large, irregular tawny spot in groin, extending a little way on the front and top of femur; limbs chocolate above, the forearm and upper leg surfaces with several narrow clove brown crossbars; posterior femur clove brown, with a large irregular cadmium orange spot running along its median line; sides of head clove brown, immaculate except for paler tips on the many pustules; sides of body lightening to burnt umber, with a few round cream spots on the lower half; chin and chest dark drab gray with many small buff spots; belly lightening to immaculate dull ochraceous; anterior femur dark drab with large clove brown spots above and small buff spots below; lower surfaces of femur drab to dull ochraceous. Palms of hands and soles of feet slate gray; tips of toes and fingers dull buff.

Remarks.—While *Lithodytes lineatus* resembles some species of *Leptodactylus* rather closely, it can be distinguished from them because its terminal phalanges are T-shaped while those of *Leptodactylus* species are claw-shaped or simple. It seems closest to *Leptodactylus rhodomystax* in color and structure, but it can be distinguished from that species on several characters. In *Leptodactylus rhodomystax* the tongue is deeply notched, the tympanum is about two-thirds the diameter of eye, and the inner metatarsal tubercle is small and oval; in *Lithodytes lineatus* the tongue is scarcely indented, the tympanum is nearly equal to the diameter of eye; and the inner metatarsal tubercle is very heavy.

Throughout its range *Lithodytes lineatus* is very constant as to color pattern, the wide light dorsolateral stripes covering the glandular lines being present in all specimens examined. The tibia length seems to have a low variation coefficient (3.4), but this is not unknown in some other species of leptodactylids. The adpressed heel extends to the center or posterior corner of eye in about 65 percent of the examples measured; in the remaining ones it reaches between shoulder and eye.

Specimens Examined

COLOMBIA

Amazonas: Río Apaporis, USNM 144901–3.

Meta: Forzosa, near Villavicencio, USNM 144904–5; Guaicaramo, USNM 147095–100; Villavicencio, USNM 150520–1, CNHM 81792–4.

Norte de Santander: La Selva, USNM 147101–2.

BRITISH GUIANA: USNM 118179.
ECUADOR: Alpa-Yacu, near Mera, Napo-Pastaza, USNM 118710.

Genus *Niceforonia* Goin and Cochran

1963. *Niceforonia* Goin and Cochran, p. 499 (type species, *Niceforonia nana*).

Diagnosis.—A leptodactylid with a cartilaginous sternum; terminal phalanges terminating in an expanded knob but not distinctly T-shaped; tips of digits not expanded into distinct disks; no tympanum apparent; pupil horizontal; maxillary teeth present; no odontoids on mandible; vomerine teeth in two small, distinct patches lying well behind the small choanae; tongue elongate, entire and free behind; fingers free of web, toes with but the merest vestige of web at the base; cranial derm free of skull; roof of skull not exostosed.

Niceforonia nana Goin and Cochran

Figure 45

1963. *Niceforonia nana* Goin and Cochran, p. 499, fig. 1 (type locality, Páramo de La Rusia, Santander, Colombia).

Description.—USNM 150643 (=MLS 142, holotype), an adult female from Páramo de La Rusia, Santander, Colombia. No bony ridges on top of head. Vomerine teeth in two short, slanting, narrowly separated series far behind the choanae; tongue one-half as wide as mouth opening, elongate, broadly oval, its posterior border free and unnotched; snout moderate in length, rounded when viewed from above, slanting forward in profile, the upper jaw extending very slightly beyond the lower. Nostrils small, scarcely projecting, their distance from end of snout a trifle greater than their distance from eye. Canthus rostralis strong, curved; loreal region weakly concave, slanting outward to the upper lip. Eye rather small, but with very thick lids that give it additional prominence, its diameter about four-fifths its distance from tip of snout; interorbital diameter 1½ times that of upper eyelid, equal to interval between nostrils. Tympanum concealed. Fingers moderately long, with faint lateral ridges, free, their tips scarcely enlarged, first finger a little shorter than second, which equals the fourth, both of these extending to base of terminal phalanx of third; a distinct oval thumb pad present, also a pad at base of second finger; a rounded palmar callus; metacarpal tubercles well developed. Toes fairly long, with little trace of web, third toe longer than fifth, its tips reaching to middle of antepenultimate phalanx of fourth, the tips of all toes slightly enlarged and flattened above; a distinct, oval inner metatarsal tubercle and a smaller, rounded outer one; no apparent tarsal ridge; a series of heavy skin-folds on heel and knee. Body very stout, in postaxillary region much wider than greatest width of head. When hind leg is adpressed, heel reaches front of shoulder; when limbs are laid along the side, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are narrowly separated. Skin of upper parts finely granular, with a narrow, interrupted, lateral glandular line between posterior border of eye and sacrum; some heavy tubercles scattered over posterior third of back; sides heavily granular; venter smooth on throat, chest, and anterior half of belly, becoming granular on posterior part of belly, on posterior femur, and below vent; a short, thick, glandular ridge from lower posterior corner of eye, dropping behind corner of mouth, and continuing as a series of two or three small glands along side of neck, ending on proximal anterior part of humerus; a strong skinfold across chest; a very distinct ventral disk.

Dimensions.—Head and body, 20.5 mm.; head length (to end of upper jaw), 7 mm.; head width, 7.5 mm.; femur, 8 mm.; tibia, 7.5 mm.; foot, 8 mm.; hand, 5.5 mm.

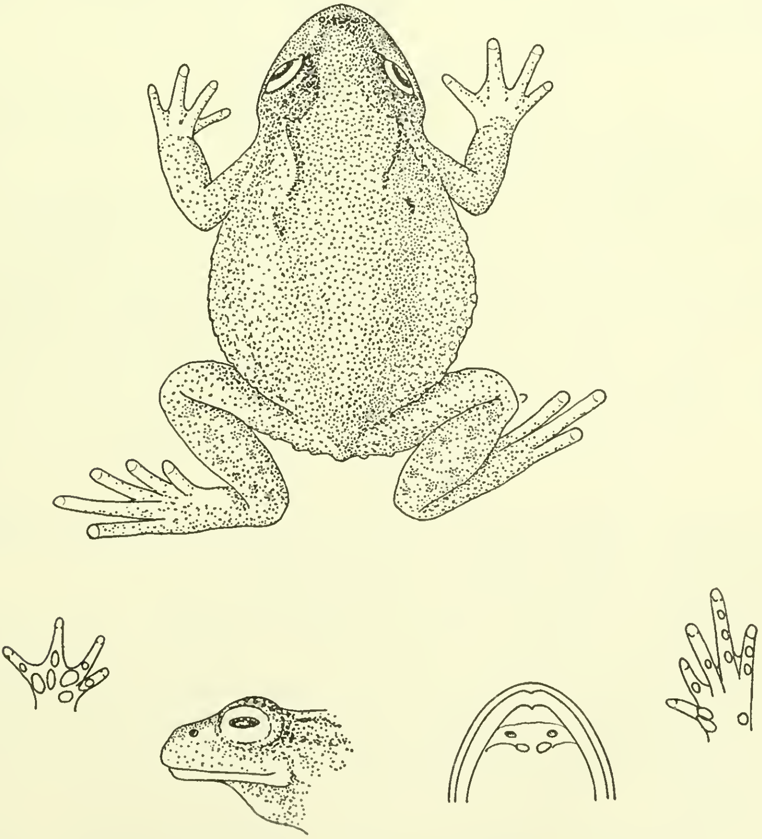

FIGURE 45.—*Niceforonia nana,* holotype, USNM 150643 (× 3).

Color in alcohol.—Dorsum seal brown to walnut brown, lightening on sides to wood brown; venter wood brown, immaculate except for some darker shadings between the granules on posterior belly; side of head immaculate fawn color, becoming a little darker near canthus; anterior femur seal brown on upper half, light wood brown on lower half; posterior thigh Mars brown with one or two paler spots; soles of feet and palms of hands pale wood brown, their tubercles and webs similar in color.

Remarks.—The relationships of *Niceforonia nana* are at present not clear. In many ways this species is structurally more like the forms of *Borborocoetes* which lack the tympanum.

When first examined, the type gives one the impression that it is an immature frog, but it is a female packed with large ripe eggs.

The large unpigmented eggs (approximately two millimeters in diameter) probably indicate that *Niceforonia nana* is a terrestrial breeder. This would not be unexpected or inappropriate for a frog inhabiting the páramos.

Genus *Physalaemus* Fitzinger

1826. *Physalaemus* Fitzinger, pp. 39, 65 (type species, *P. cuvieri* Fitzinger [=*Liuperus albonotatus* Steindachner]).

Generic diagnosis.—Pupil horizontal. Tongue elliptical, entire, and free. Fingers free; toes free or slightly webbed, often fringed; tips of digits not dilated. Outer metatarsals united. Vomerine bone with a backwardly directed process; quadratojugal present, forming a suture with the maxillary. Omosternum cartilaginous; sternum with a bony style which is often furcate posteriorly. Sacral diapophyses slightly dilated. Terminal phalanges simple.

Physalaemus neglectus dunni, new subspecies

PLATE 67A–C

Holotype.—USNM 147108, an adult male from Acacías, Meta, Colombia, collected by Hno. Nicéforo María.

Paratypes.—See list of other specimens examined.

Diagnosis.—Vomerine teeth present or absent; when present, weakly developed. Sternal style bifurcate. Tympanum not distinct, its posterior border usually not readily visible. Skin of dorsum fairly smooth, seldom possessing the short raised glandular lines outlining the pattern, as in typical *P. neglectus* (Ahl). Sole of foot smooth, or nearly so.

Description of holotype.—Vomerine teeth very weakly developed (in this specimen); tongue less than one-half the width of mouth opening, long and narrowly oval, its free posterior border not indented;

snout moderately long, rounded when seen from above and in profile, the upper jaw projecting considerably beyond the lower; nostrils superolateral, their distance from end of snout one-half their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis not very prominent, rounded, the loreal region flat, sloping outwards to upper lip. Eye moderate, prominent, its diameter about five-sixths its distance from tip of snout; interorbital diameter 1½ times the width of upper eyelid, equal to interval between nostrils. Tympanum small and not at all distinct, especially its posterior border, apparently about one-third the eye diameter and separated from the eye by a distance nearly equal to its own diameter. Fingers rather long, free, with small lateral ridges and bulbous tips, first, second, and fourth fingers subequal; a prominent oval tubercle at base of thumb and another similar to it on palm; metacarpal tubercles large and prominent; toes free, ridged laterally, their tips less bulbous than those of the fingers, third much longer than fifth, extending halfway on antepenultimate phalanx of fourth; metatarsal tubercles small but distinct, somewhat compressed, the inner one slightly larger than the outer; a small tarsal tubercle at about one-third the distance from inner metatarsal tubercle to heel, and separated from the inner one by a distance greater than that separating the two metatarsals; a large flat inguinal gland, nearly concealed when hind legs are folded. Body elongate, in postaxillary region equal to greatest width of head; when hind legs are adpressed, heel fails to reach posterior corner of eye, and metatarsal tubercles just reach the tip of snout; when limbs are laid along the body, heel and elbow overlap, when hind legs are placed at right angles to body, heels slightly overlap. Skin of upper parts minutely glandular, with a pair of lateral folds from posterior corner of eye along the sides, fading out before reaching groin; venter smooth, with a very pronounced ventral disk; area behind anus and on posterior femur coarsely granular. Male with a very large vocal sac extending across throat and with a semicircular fold at each side when sac is deflated; dark thumb patches also present in the male.

Dimensions.—Head and body, 30 mm.; head length, 9 mm.; head width, 9.5 mm.; femur, 12 mm.; tibia, 13 mm.; foot, 13.5 mm.; hand, 8.5 mm.

Color in alcohol.—Dorsum sepia, the lateral folds and supratympanic ridges clove brown; a dark W-shaped area between the shoulders, followed by a paler sepia oval spot; indistinct darker marblings on posterior part of back; arms and legs fawn color, with wide indistinct darker bars; a small black spot on upper forearm, on outer tibia, and several such spots along outer anterior surface of femur, but none on inguinal gland, which is clove brown; a clove brown stripe along posterior surface of forearm and upper arm, and a similar but paler one on outer half of tarsus and outer part of sole of foot; venter pale immaculate ecru drab. Throat pouch of male black laterally and anteriorly.

Remarks.—The female is usually lighter in color than the male, and shows a black spot on each side of the pale oval mark between the shoulders. The throat and most of belly are dark sepia, although occasionally the belly is fairly light with a sprinkling of small dark spots.

The head length is the most variable proportion in this form, as one expects from the very indistinct posterior tympanic border from which the head length is measured. In comparing the other five critical measurements of the new form with those of typical *P. neglectus* (formerly known as *cuvieri*) of Brazil, it was found that the total range of *neglectus* covers that of *P. neglectus dunni*, while twice the standard error from the mean overlaps, or is separated by a slight interval.

While Dunn (1944c, p. 512) mentioned the supposed existence of a new species represented by specimens he had collected at Villavicencio in Meta and Caño de la Hermosa, Boyacá, he considered its close ally to be *Physalaemus biligonigerus* (Cope)—found from southern Brazil to northern Argentina—apparently because he found more or less well-marked vomerine teeth in his specimens, a character then presumed to distinguish Cope's *biligonigerus* from all other members of the genus. But *biligonigerus* has very shovel-shaped metatarsal tubercles, while the feet of the Colombian frog have small tubercles that are only slightly compressed and are not at all shovel-shaped. The wide body, thick legs, and heavily glandular skin of *biligonigerus* do not suggest the rather slender build, delicate legs, and nearly smooth skin of *P. neglectus dunni*.

The new subspecies resembles the nominate form of *neglectus*, which ranges from Brazil to Argentina. In discussing Brazilian *P. neglectus* (as *cuvieri*), the senior author (Cochran, 1951, p. 344) noted that it shows every gradation from a complete absence of vomerine teeth to the presence of such teeth in fairly well-marked patches. The new subspecies resembles it in this respect. The slight differences noted in the diagnosis seem to be reasonably stable.

While Medellín frogs are separated by the Eastern Cordillera from other examples of this form, the three frogs in the series ANSP 24113–5 (from Medellín) agree well with the holotype from Meta and the other specimens; hence, they are included among the paratypes. None of the Medellín frogs has any trace of vomerine teeth. The third metatarsal tubercle is represented only by a slight enlargement of the tarsal fold, but a pointed tubercle is lacking.

A female (MLS 128) from San Gil, Santander, differs from the Meta and Boyacá frogs in having a slightly wider head and longer legs, but until many more examples have been studied from San Gil the constancy of these apparent differences cannot be estimated.

We name this form for the late Dr. Emmett R. Dunn, whose interest in Colombian herpetology preceded our own and whose collections have been very useful.

Other Specimens Examined

(All Paratypes)

COLOMBIA

Boyacá: Llanos de Boyacá, east of the Andes, USNM 147103–7 (juv.); Caño de la Hermosa, CNHM 81917; Miraflores, USNM 153922–3.

Antioquia: Medellín, ANSP 24113–5.

Meta: Acacías, USNM 147109–10, MLS 96b; Río Ocoa, south of Villavicencio MLS 282 (juv.); Villavicencio, CNHM 81919, USNM 147249, MLS 130; Granada on Río Ariari, south of Villavicencio, USNM 151478–93.

Santander: San Gil, MLS 128.

Genus *Pleurodema* Tschudi

1838. *Pleurodema* Tschudi, p. 84 (type species P. *bibronii* Tschudi).

Generic diagnosis.—Pupil horizontal. Tongue subcircular or oval, free and entire or slightly notched posteriorly. Vomerine teeth present or absent. Fingers free; toes free or webbed, often fringed; tips of digits not dilated. Outer metatarsals united. Vomerine bone with a backwardly directed process; quadratojugal reduced or absent, if present not reaching the maxillary. Omosternum cartilaginous; sternum with a bony style which is usually single, sometimes furcate posteriorly. Sacral diapophysis slightly dilated. Terminal phalanges simple.

Two species are recognized from Colombia—one apparently quite rare and the other fairly common and wide-ranging. They readily may be distinguished from each other by the presence or absence of vomerine teeth and by other characters.

Key to Colombian Species of *Pleurodema*[*]

a^1. Vomerine teeth present; toes not webbed; both metatarsal tubercles large and shovel-shaped . . . . **P. brachyops**

a^2. Vomerine teeth absent; toes webbed at base, with distinct fringes; a heavy lunar inner metatarsal tubercle and a shovel-shaped outer one. **P sagittifer**

Pleurodema brachyops **(Cope)**

Plate 66a–c

1858. *Pleurodema bibroni*, var. b.—Günther, 1858, p. 32.

1863. *Pleurodema elegans* (not of Bell).—Steindachner, 1863, p. 186, pl. 1, figs. 1–5; 1867, p. 14.

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[*] After Parker (1927).

1869. *Lystris brachyops* Cope, p. 312 (type locality, Magdalena River, New Granada).

1877. *Pleurodema sachsi* Peters, p. 460 (type locality, San Fernando de Apure, Venezuela).

1882. *Paludicola brachyops.*—Boulenger, 1882a, p. 232, fig. F.—F. Müller, 1884, p. 281.—Boettger, 1892, p. 30; 1893, p. 40.—Andersson, 1906, p. 8.—Meek, 1910, p. 415.

1922. *Pleurodema brachyops.*—Ruthven, 1922, p. 53.—Nieden, 1923, p. 499.—Miranda-Ribeiro, 1926, pp. 156, 221.—A. Lutz, 1927, pp. 39, 46, pl. 12, fig. 23.—Crawford, 1931, p. 31.—Schmidt, 1932, p. 160.—Parker, 1935, p. 507.—Schubart, 1939, p. 55.—Dunn, 1944c, p. 511.—Brongersma, 1948, pp. 89, 92, fig. 31.—Ginés, 1959, p. 116.—Rivero, 1961, p. 88; 1964b, p. 311.—Gorham, 1963, p. 20.

1933. *Paludicola sachsi.*—Stejneger, 1933, p. 48.

Description.—USNM 117514, an adult male from Río César, Atlántico, Colombia. Vomerine teeth in two small, oval, widely separated series between the choanae; tongue large, two-thirds as wide as mouth opening, cordiform, its posterior border free and deeply notched; snout broadly rounded when viewed from above, truncate in profile and nearly vertical, the upper jaw extending well beyond the lower. Nostrils more lateral than dorsal, scarcely projecting, their distance from end of snout one-half their distance from eye. Canthus rostralis blunt; loreal region slightly concave, sloping outward to upper lip. Eye large, prominent, its diameter 1¼ times its distance from tip of snout; interorbital diameter two-thirds that of upper eyelid and a little less than interval between nostrils. Tympanum large, distinct, its greatest diameter three-fifths that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers long, slender, their tips not enlarged, with lateral ridges, free, first finger much longer than second or fourth, its tip reaching halfway on penultimate phalanx of third; a prominent oval thumb pad present; a larger palmar callus; metacarpal tubercles well developed. Toes long, webbed at base, their tips not enlarged, third finger longer than fifth, its tip reaching to middle of antepenultimate phalanx of fourth; a small, shovel-like inner metatarsal tubercle, and a larger semicircular outer one; a narrow tarsal ridge ending diagonally near heel; a distinct skinfold on heel and knee. Body stout, in postaxillary region a little narrower than greatest width of head. When hind leg is adpressed, heel reaches posterior corner of eye; when limbs are laid along the sides, knee and elbow just touch; when hind legs are bent at right angles to body, heels are widely separated. Skin of upper parts smooth (pustular under the lens), with a long glandular dorsolateral ridge from eye to groin and a shorter one above and behind the tumpanum; a large oval gland on flank in front of groin; venter smooth (faintly pustular under lens) except for small granules below vent and along posterior femur;

a heavy skinfold across chest; a pronounced ventral disk; an external median vocal sac.

Dimensions.—Head and body, 36 mm.; head length, 12 mm.; head width, 14.5 mm.; femur, 14.5 mm.; tibia, 15 mm.; foot, 13.5 mm.; hand, 10 mm.

Color in alcohol.—Dorsum cinnamon anteriorly to drab posteriorly, with three long, irregular, transverse seal-brown markings, the first between the shoulders; a seal-brown chevron between the eyes, its ends extending across the eyelids; limbs pale wood brown, the upper leg surface with two wide brown crossbars; chin and chest buff, the remainder of lower surfaces immaculate ecru drab. Sides of head olive buff, with an indistinct, squarish darker spot from eye to upper lip border, and two dark triangular marks on the snout separated by a narrow buff median line. Anterior and posterior surfaces of femur immaculate buff; the round inguinal gland black. Soles of feet and palms of hands immaculate buff.

Remarks.—According to Parker (1927b), this species is found in northeastern Colombia, Venezuela, Brazilian Guiana, and Aruba Island. Andersson (1906) seemed doubtful that Cope's name *brachyops* which applied to a specimen from Magdalena River, New Granada, could be used for the more easterly frogs of Venezuela, Brazilian Guiana, and Aruba. Unfortunately, no Chocó specimens have come to hand, so this problem remains unsettled.

Notes on the types of *Lystris brachyops* Cope by the junior author:

Types.—ANSP 2260–4, Río Magdalena, Atlántico, Colombia, collected in 1869 by Buckow. The five specimens—ANSP 2260, 2262 (females), 2261 (juvenile), 2263–4 (males)—are in very good condition. Each is tannish above with light brown mottlings; and on each there is a pair of dark chocolate brown bands just anterior to base of leg and lateral to ilium. The spots are ovoid and about 4 by 5 millimeters.

Description of ANSP 2260, an adult female.—Tongue nearly round, not notched behind, about one-half as wide as mouth opening. Internal nares small, rounded, and situated well forward in roof of mouth. Vomerine teeth in two tiny oval patches between internal nares, the patches separated on the midline by about the diameter of a single patch, each patch about one-half the diameter of an internal naris. Head about as broad as long, somewhat pointed, tapering to a rounded snout; snout blunt as seen from side, very slightly projecting; eyes relatively small for a frog of this size, not protuberant; greatest diameter of eye slightly less than distance from eye to snout; nostril near tip of snout; interorbital space about one-half diameter of eye; tympanum distinct, one-half the diameter of eye, separated from eye by one-half its own diameter; upper eyelids, top of head, and dorsum smooth. Fingers and toes without disks; fingers moderately slender, entirely free of webs; toes moderately slender, slightly webbed at base; fingers 3–1–4–2 and toes 4–3–5–2–1 in order of decreasing length; heels in contact when legs are flexed with femora held at right angles to body; throat and venter smooth, underside of thigh somewhat rugose. Knees and elbows scarcely meeting when legs are pressed along the side of the body; heel not reaching posterior border of tympanum when hind leg is adpressed.

Coloration.—Ground color above dark tan, top of head and dorsum mottled with a pale brown; top of thigh and crus somewhat paler in ground color than the dorsum, top of thigh with a median dorsal patch of the brown, and crus with two bands of similar brown color. Underside of chin, venter, and legs immaculate. A pair of chocolate brown glandular areas present, one on each side just anterior to thighs and lateral to ilium; these areas (4 by 6 mm.) are over slight rounded elevations.

Dimensions in millimeters.—Snout to vent, 44; head width, 16; tip of snout to posterior edge of tympanum, 13; diameter of eye, 4; diameter of tympanum, 2; vent to tip of longest toe, 54; vent to heel, 31.

Variations.—Except for the immature specimen (ANSP 2261), the syntypes are very similar. In the two males the skin on underside of the throat is darker and more folded than in the two females. The immature specimen is smaller (snout-vent, 30 mm.) and somewhat more faded than the adults.

Specimens Examined

COLOMBIA

Atlántico: Barranquilla, USNM 150988–91, CM 33390 (8), UF 7971, USNM 152642; Río César, USNM 117514; Río Magdalena, USNM 144909, ANSP 2260–4 (syntypes).

Bolívar: Villanueva, USNM 117512; Cartagena, Barrio Naval, CNHM 74916; Sincelejo, USNM 144906–8.

Guajira: One mile south of Manaure, Pájaro, USNM 151307–24; Piojo, 100 m., USNM 152678–87.

Magdalena: Ciénaga, USNM 144161–2; Curumaní, MCZ 21495–8; Finca El Aramar, Bonda, USNM 152713–4; Santa Marta, MCZ 6074.

CURAÇAO: Landhuis Knip, USNM 118654–5.

PANAMA: Herrera: Parita, USNM 127251–2.

VENEZUELA: Sierra de Santa Ana, Falcón, USNM 117525, 128841–4; Palenque, Guarico, USNM 128840; Campo de Lago, Lagunillas, USNM 115757–8; Los Aniles, Margarita Island, USNM 139069.

***Pleurodema sagittifer* (O. Schmidt)**

Plate 66d–f

1857. *Leiuperus sagittifer* O. Schmidt, p. 10 (type locality, New Granada); 1858, p. 240.—Garman, 1876, p. 278.

1882. *Paludicola sagittifera.*—Boulenger, 1882a, p. 236.

1923. *Paludicola sagittifer.*—Nieden, 1923, p. 512.

1927. *Pleurodema sagittifer.*—Parker, 1927, p. 475.—Dunn, 1944c, p. 512.—Gorham, 1963, p. 20.

Description.—USNM 144910, an adult male from Barranquilla, Atlántico, Colombia. Vomerine teeth absent; tongue two-thirds as wide as mouth opening, very broadly ovate, its posterior border free and slightly notched; snout short, rounded when viewed from above, truncate in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, scarcely projecting, almost terminal, their distance from end of snout scarcely one-fourth their distance from eye. Canthus rostralis bluntly rounded; loreal region flat, sloping outward to the upper lip. Eye large, prominent, its diameter equal to its distance from tip of snout; interorbital diameter about three-quarters that of upper eyelid, a trifle greater than distance between the nostrils. Tympanum small but distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to its own diameter. Fingers moderate, the tips not enlarged, free, first finger longer than second or fourth, its tip reaching to base of ultimate phalanx of third; a small oval thumb pad present; a larger rounded palmar callus; metacarpal tubercles well developed. Toes quite short, webbed at the base, with distinct lateral ridges, third and fifth toes subequal, their tips reaching to base of antepenultimate phalanx of fourth toe; a heavy semilunar inner metatarsal tubercle and a somewhat larger, more rounded, shovel-shaped outer one; a faint tarsal ridge, ending halfway to heel; a heavy skinfold on heel and knee. Body very stout, in postaxillary region nearly equal to the head width. When hind leg is adpressed, heel reaches front of shoulder; when limbs are laid along the side, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels are widely separated. Skin of upper parts faintly pustular, the pustules most apparent on top of head; an oval gland slightly longer than snout above groin on flank, not concealed when hind legs are folded; several smaller and less-distinct glands on back and sides; venter smooth, except for some small pustules below the anus. A broad, low glandular ridge from posterior corner of eye above tympanum, ending in front of the swollen temporal area behind tympanum. A heavy skinfold across chest; a very prominent ventral disk, the skin of posterior belly in fine wrinkles paralleling the outlines of disk; a median external vocal sac.

Dimensions.—Head and body, 38.5 mm.; head length, 11 mm.; head width, 16 mm.; femur, 15 mm.; tibia, 14 mm.; foot, 13.5 mm.; hand, 10.5 mm.

Color in alcohol.—Dorsum mouse to drab gray, with a slate-black W between the shoulders; a large slate spot on the temporal region, and a few other less-regular slate markings down center of back;

upper edge of lateral gland bordered with pearl gray, the remainder of gland black; inguinal and prefemoral region just below the gland salmon-buff, this color ending abruptly on sides just anterior to the gland and covering the proximal half of anterior femur, which is immaculate; rest of sides and most of venter olive-buff to cream buff; posterior part of throat (of male) suffused with slate gray; distal half of anterior femur suffused with sepia, concentrated to one wide crossbar and two or three narrower, less-distinct crossbars on upper surface; posterior femur and adjoining half of tibia vinaceous pink to salmon buff, immaculate except for a suffusion of slate under the knee, and a black spot at lower posterior end of wide bar on upper femur; remainder of upper leg and foot surfaces with indistinct mouse gray crossbars on a slightly paler background; arms cream buff, with a few light gray spots and bars; soles of feet and lower tarsus mouse gray, the metatarsal and metacarpal tubercles cream-buff; palms of hands also cream-buff; sides of head drab gray, with a wide vertical slate spot below eye and another below nostril; center of snout tip with a pale olive vertical line.

Remarks.—The above-described male is remarkably similar to *Craspedoglossa stejnegeri* (from the Organ Mountains, Rio de Janeiro, Brazil) in external characters, both having short heads with swollen temporal regions, heavy shovel-like metatarsal tubercles, and large lateral glands. *C. stejnegeri,* however, has a well-developed set of vomerine teeth; the lateral gland is lower on the body, being concealed when the hind legs are in sitting position; the toes are somewhat longer than those of *Pleurodema sagittifer;* and the terminal phalanges are knob-like instead of claw-shaped as in *sagittifer.*

Pleurodema sagittifer was buried in the synonymy of *P. marmorata* until Parker (1927b, p. 467), revived it in his discussion of the genus. The two species are alike in possessing a lumbar gland, but in *sagittifer* the interorbital space is narrower than the upper eyelid and the eyes are unusually prominent, while in *marorata* the interorbital space is as broad as the upper eyelid and the eyes are not more prominent than is usual in frogs. These two species are widely separated by almost the entire mountain system of Colombia; in fact, we do not know of any examples of *marmorta* collected north of Peru.

The described specimen (USNM 144910, from Barranquilla, Atlántico), was the only example of this species examined.

Genus *Pseudopaludicola* Miranda-Ribeiro

1926. *Pseudopaludicola* Miranda-Ribeiro, p. 152 (type species, *Liuperus falcipes* Hensel).

Generic diagnosis.—Pupil horizontal. Tongue oval, entire, free behind. Vomerine teeth present. Fingers free; toes slightly webbed, fringed; tips of digits simple or very slightly dilated; outer metatarsals united. Vomerine bone lacking a backwardly directed process. Quadratojugal small, not reaching the maxillary; omosternum cartilaginous; sternum elongate, cartilaginous or calcified. Sacral diapophyses only slightly dilated. Terminal phalanges simple or T-shaped.

Pseudopaludicola pusilla **(Ruthven)**

PLATE 66G–I

1916. *Paludicola pusilla* Ruthven, p. 1 (type locality, Fundación, Santa Marta Mountains, Magdalena, Colombia).
1922. *Pleurodema pusilla.*—Ruthven, 1922, p. 54.
1927. *Pseudopaludicola pusilla.*—Parker, 1927b, p. 455.—Dunn, 1944c, p. 509. Ginés, 1959, p. 108. fig.—Rivero, 1961, p. 86; 1964a, p. 301.—Gorham, 1963, p. 20.

Description.—USNM 144911, an adult male from Villavicencio, Meta, Colombia. Tongue two-fifths as wide as mouth opening, elongate, oval, its posterior border free and unnotched; snout moderate, rounded when viewed from above, rounded in profile, the upper jaw extending well beyond the lower. Nostrils dorsolateral, projecting, their distance from end of snout about one-half their distance from eye; Canthus rostralis blunt, rounded; loreal region concave, with a deep furrow on its lower margin above the upper lip. Eye large, prominent, its diameter about two-thirds its distance from tip of snout; interorbital diameter equal to that of upper eyelid, equal to interval between nostrils. Tympanum indistinct, its greatest diameter apparently about one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers and toes with slightly enlarged terminal disks; fingers long, with distinct lateral ridges, free, first finger shorter than second, which equals the fourth, second and fourth fingers reaching to base of antepenultimate phalanx of third; a small oval thumb pad present; a larger round palmar callus; metacarpal tubercles well developed. Toes long, free, slender, third toe longer than fifth, its disk reaching to base of penultimate phalanx of fourth; a small oval inner metatarsal tubercle and a smaller conical, prominent outer one; a diagonal tarsal ridge ending midway to heel in a slight elevation; a very small papilla on heel (on left heel only in this specimen); a heavy skinfold on heel and knee. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches anterior border of eye; when limbs are laid along the side, knee and elbow are slightly separated; when hind legs are bent at right angles to body, heels just touch. Skin of upper parts very pustular, the pustules forming small rounded glands on head and along dorsolateral area; an X-shaped gland between the shoulders; venter smooth, except for some weak granules behind anus; a faint narrow, glandular ridge from posterior corner of eye above tympanic area, ending in front of shoulder; a weak skinfold across chest; a slight ventral disk; a pair of lateral external vocal sacs in the male.

Dimensions.—Head and body, 15.5 mm.; head length, 5 mm.; head width, 5 mm.; femur, 6 mm.; tibia, 7.5 mm.; foot, 7 mm.; hand, 3.5 mm.

Color in alcohol.—Dorsum uniform vandyke brown; venter and posterior femur bistre, immaculate. Sides of head drab, with some vague bistre spots.

The Villavicencio frogs (USNM 144911–26) are pale vinaceous-cinnamon to drab above, with the area between the dorsolateral lines drab to olive, the lines irregularly marked with sepia patches at intervals; the limbs also pale vinaceous-cinnamon with faint drab crossbars, those at elbow and kneecap usually ending in a large dark sepia spot; postfemoral region buff with a wide sepia stripe down the middle; side of head ecru drab with small round sepia dots along borders of lips, venter olive buff with suffused dark dots on throat, chest, and lower femur.

Remarks.—Parker (1927b) reported this species only from Colombia, but the United States National Museum has specimens from Venezuela also. In Colombia the species is known from Guajira, Magdalena, and Meta.

The type description states that the tibiotarsal articulation (the "heel") comes to the angle of the jaws, but in USNM 118721 (formerly MZUM 54589, received in exchange as a typical specimen of *pusilla*), the heel reaches the anterior corner of the eye, as it does in nearly all other examples of the species. The heel tubercle also varies in development, sometimes being sharp and distinct, sometimes a mere knob.

While their small size and extreme agility would seem to insure their abundance wherever they occur, these tiny frogs seldom are secured in quantity for museum collections. The "discontinuous distribution" of the genus, mentioned by Parker (1927b, p. 454), is probably more apparent than real, as careful collection near Villavicencio has turned up many examples of *pusilla* there, and the known range has been extended into Venezuela by the specimens from Amazonas and Rosario.

Specimens Examined

COLOMBIA

GUAJIRA: Río Barbacoas, Arroyo de Arenas, USNM 118182, 118721–2.
MAGDALENA: Gaira, AMNH 14353–4, MCZ 4757 (paratype).
META: Villavicencio, USNM 123567, 144911–26, 147111–21.

VENEZUELA: Amazonas: Puerto Ayacucho near Venado, USNM 80674. Rosario: Near Rosario, USNM 115760–6.

Genus *Trachyphrynus* Goin and Cochran

1963. *Trachyphrynus* Goin and Cochran, p. 502 (type species, *Trachyphrynus myersi*).

Generic diagnosis.—A leptodactylid with T-shaped terminal phalanges, a distinct tympanum, no vomerine teeth, and rounded sacral diapophyses.

The combination of T-shaped phalanges and no vomerine teeth makes this genus readily separable from all forms except *Crossodactylus* and *Crossodactylodes.* The presence of a tympanum distinguishes it at once from *Crossodactylodes.* It differs from *Crossodactylus,* which is perhaps its closest relative, in having tips of the digits simple rather than furrowed above. It is not yet known if the males have the spines at the base of the first finger as do the males of *Crossodactylus.*

Trachyphrynus myersi Goin and Cochran

FIGURE 46

1963. *Trachyphrynus myersi* Goin and Cochran, p. 502, fig. 2 (type locality, 20 miles east of Pasto, Nariño, Colombia).

Description.—CAS 85177 (holotype), an adult female from 20 miles east of Pasto, Nariño, Colombia. No bony ridges on top of head; no vomerine teeth; maxillary teeth weakly developed; tongue three-fourths as wide as mouth opening, nearly circular, its posterior border free and not indented; snout broadly rounded when viewed from above, narrowly truncate in profile, the upper jaw extending slightly beyond the lower. Nostrils lateral, strongly projecting, their distance from end of snout about one-half their distance from eye. Canthus rostralis appearing sharp because of a glandular ridge along it from eyelid almost to nostril; loreal region flat, vertical, with the upper lip flaring sharply below it. Eye large, prominent, its diameter nearly as great as its distance from end of snout; interorbital diameter 1½ times that of upper eyelid, much greater than interval between the nostrils. Tympanum distinct, its greatest diameter one-half that of eye, separated from eye by an interval equal to one-half its own diameter. Fingers fairly long, with disks on the three outer ones, the inner finger not enlarged at tip, all with very faint lateral ridges, free, first finger shorter than second, fourth longer than either and reaching to base of penultimate phalanx of third, the disk of which covers one-fourth the tympanum; an oval thumb pad present, and a cordiform palmar callus; metacarpal tubercles well developed. Toes long, barely webbed at the base, third and fifth subequal, their disks reaching to base of antepenultimate phalanx of fourth; disk of fourth toe covering about one-third of tympanum, hence a trifle larger than that of third finger; a large, blunt oval inner metatarsal tubercle and a smaller, rounded outer one; a weak inner tarsal ridge, enlarged into an oval gland just behind the inner metatarsal tubercle and ending before reaching heel; a row of three or four small elongate glands along outer tarsal border, ending with a small blunt heel tubercle. Body stout, in postaxillary region equal to greatest width of head. When hind leg is adpressed, heel reaches posterior border of tympanum; when limbs are laid along the side, knee and elbow are widely separated; when hind legs are bent at right angles to body, heels barely touch. Skin of upper parts with many spiny glandules and a network of glandular lines, the most prominent of which are the dorsolateral ones, an X-shaped pair behind head and several transverse ones on sacrum and across tibia; head with a small, pointed gland at tip of snout; venter coarsely granular on belly, faintly granular on chest,

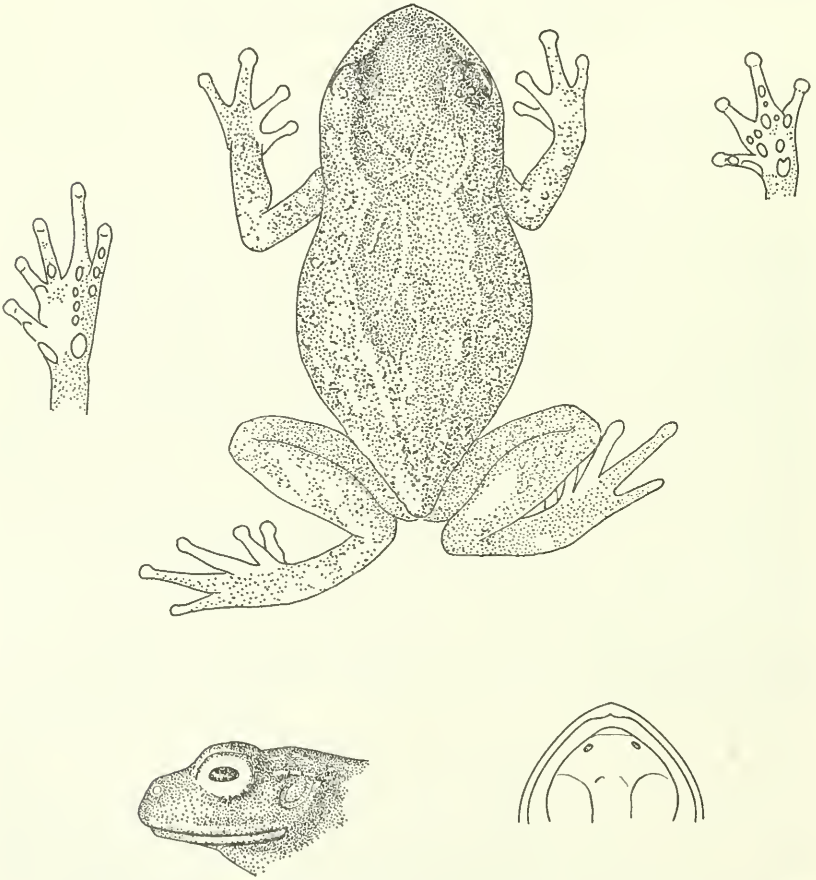

Figure 46.—*Trachyphrynus myersi*, holotype, CAS 85177 (× 3).

throat, and lower thigh; a fine glandular ridge from posterior corner of eye above tympanum, ending behind it; no skinfold across chest; no ventral disk.

Dimensions.—Head and body, 22 mm.; head length, 8 mm.; head width, 8.5 mm.; femur, 8 mm.; tibia, 8.5 mm.; foot, 8 mm.; hand, 6 mm.

Color in alcohol.—Dorsum clove brown, the glandular lines olive-gray; a pair of large russet spots on upper surface of tibia between the diagonal glandular ridges; throat, chest, and most of belly clove brown, except for a narrow buff rim around lower jaw and several large buff spots across posterior abdomen; lower limb surfaces buff with numerous brown marblings, especially on lower thigh and arm, and a brown patch on heel and elbow; side of head with a large buff spot from edge of upper lip to eye; canthus, loreal region and posterior part of jaw dull clove brown; side of body uniform clove brown except for a very large buff to rose pink inguinal patch and a small axillary spot, both with irregular outlines; anterior and posterior thigh rose pink with a few brown marblings, the brown concentrated below anus in an irregular, dark postanal patch; palms of hands and soles of feet buff, the latter with some brown marblings on three outer toes.

Remarks.—Since this individual is a mature female containing large, unpigmented eggs, it is probable that the species is a terrestrial breeder. The abdominal eggs are, like those of *Niceforonia*, two millimeters in diameter.

The holotype (CAS 85177, from Nariño) was the only specimen examined.

Subfamily Rhinodermatinae

Sternum and omosternum cartilaginous. Epicoracoid cartilages partly fused. Sacral diapophyses dilated. Vertebrae tend to fuse, especially the sacral vertebra with the urostyle.

Genus *Geobatrachus* Ruthven

1915. *Geobatrachus* Ruthven, p. 1 (type species, *Geobatrachus walkeri* Ruthven).

Generic diagnosis.—Rounded sacral diapophyses, concealed tympanum, fingers and toes free of web, no vomerine teeth, an omosternum present, toes four. Only one species is now known in the genus. It may be distinguished from bufonids and atelopids by the presence of an omosternum; from the other Colombian leptodactylids by the combination of rounded sacral diapophyses, concealed tympanum, and lack of vomerine teeth, and from all of them by having only four toes on the hind foot.

Geobatrachus walkeri Ruthven

FIGURES 47, 48; PLATE 67D–F

1915. *Geobatrachus walkeri* Ruthven, p. 2 (type locality, San Lorenzo, Santa Marta Mountains, Magdalena, Colombia); 1922, p. 50.—Dunn, 1944, p. 519.—Peters, 1952, p. 15.—Gorham, 1963, p. 25.

Description.—MZUM 47785 (holotype), from San Lorenzo, Santa Marta Mountains, Magdalena, Colombia. No vomerine teeth. Choanae small, rounded, and well separated; tongue one-half as wide as mouth opening; long and narrow, its posterior border free and rounded. Snout short, rounded when viewed from above, wedge-shaped in profile, the upper jaw not extending appreciably beyond lower; nostrils as superior as lateral, very slightly projecting, their distance from end of snout about equal that from eye, separated from each other by an interval half again as great as their distance from eye. Canthus rostralis slightly defined; loreal region flat and very oblique, the upper lip flaring out strongly below it. Eye small, not particularly prominent, its diameter half again as great as its distance from nostril; interorbital distance slightly less than width of upper eyelid, which is relatively narrow and slightly less than distance between nostrils. No tympanum apparent. Fingers not webbed, fourth finger slightly longer than second; no projecting rudiment of a pollex; toes (four) not webbed, second (usually third) and fourth (usually fifth) subequal; a distinct oval inner but no apparent outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body short and stubby, in postaxillary region definitely exceeding greatest width of head; when hind leg is adpressed, heel not reaching posterior margin of eye; when limbs are laid along the side, knee and elbow fail to touch; when hind legs are bent at right angles to body, heels just touch. No patagium. Skin of upper parts smooth; skin of throat and chest smooth; that of belly and lower femur uniformly and very finely granular; no traces of a skinfold across chest; no inguinal gland, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 20 mm.; head length, 6.6 mm.; head width, 6.8 mm.; femur, 7.6 mm.; tibia, 7.7 mm.; foot, 7.5 mm.; hand, 4.3 mm.

Color in alcohol.—A warm brown above, a dirty, lighter brown below.

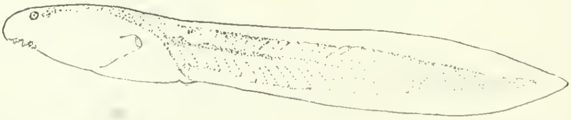

FIGURE 47.—Tadpole, *Geobatrachus walkeri* (× 2).

Variation.—As Ruthven (1922, p. 50) points out, there is more variation in this species than is indicated in the original description. In the specimens before us the dorsum ranges from very dark gray to pale reddish gray, while the ventral surfaces range from a pale, ununmarked gray to light yellowish gray with distinct, scattered, black flecks. Two of the adult specimens at hand have fairly well marked ocular vitta passing from the region of nostril through eye and terminating on the side of the body. On the other adult specimens at hand such stripes are absent. Each of the adult specimens has a very narrow, somewhat indistinct, middorsal stripe passing from top of head to vent; on two of these specimens the stripe forks at the vent and continues onto the posterior surfaces of the thighs.

Dunn (1944c, p. 519) first indicated that the true relationships of *Geobatrachus* are to members of the family Rhinodermatidae; Goin and Goin (1962, p. 241) also assign it there, but make that family a subfamily of Leptodactylidae. Therefore, the relatives of *Geobatrachus* are *Rhinoderma* of Chile, *Euparkerella* of Peru, *Noblella* of Brazil, and *Sminthillus* of Cuba.

Tadpoles.—Dr. Federico Medem collected a series of tadpoles in the general habitat of *Geobatrachus walkeri*, along the new road up to San Lorenzo, at an altitude of 1,500–1,700 meters. Pending confirmation of the specific identity of these tadpoles, they are here described as *G. walkeri* on the basis of probability.

They were collected in a small, slow-flowing stream that went alongside the road and through the woods.

These specimens have exceedingly long, whip-like tails and rather flat bodies. The eyes are dorsal in position and the spiracle is on the left side of the body. The tail has a band of pigment along its dorsal surface and another along each side in the region of the lateral septum. The upper and lower beaks are quite black and horny and extremely serrate. There is one complete and one incomplete row of teeth above the beak and there are three complete rows below the beak. The lower

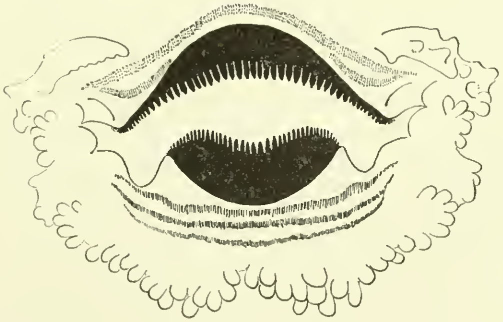

FIGURE 48.—Mouthparts of tadpole, *Geobatrachus walkeri*.

lip projects well behind the mouth as a fleshy fold which is distinctly scalloped along the edge. The largest specimen has a total length of 38 millimeters and a tail length of 27 millimeters, while the smallest has a total length of 20 millimeters and a tail length of 14.5 millimeters. Dr. Medem informs us that these tadpoles were bright red in life.

Specimens Examined

COLOMBIA

MAGDALENA: San Lorenzo, MZUM 47785 (holotype); Finca La Granja, road to San Lorenzo, 2,300–2,700 m., USNM 150886–91, 151068.

Family CENTROLENIDAE

The members of this family may be characterized as follows: procoelous; arciferal pectoral girdle; astragalus and calcaneum fused into a single element; intercalary cartilages between penultimate and ultimate phalanges; terminal phalanges T-shaped; sacral diapophyses dilated; omosternum absent; sternum small and cartilaginous. The frogs in this family differ from all other South American frogs except Psudidae and Hylidae by the presence of intercalary cartilages. From both of these they differ in having the terminal phalanges T-shaped rather than claw-shaped.

Key to Colombian Genera of Centrolenidae

*a*¹. Size large (77 mm., maximum head-and-body length) and build massive, with the digital disk of third finger large enough to cover eye. Male with an exceedingly well-developed humeral spine, the tip of which fits into an antrum in the enlarged forearm............................**Centrolene**

*a*². Size small (about 35 mm., maximum head-and-body length) and build delicate, with the eye larger than the digital disk of third finger. Humeral spine in male varies in different species from impalpable to protruding but there is no antrum in the forearm to receive the tip.............**Centrolenella**

Genus *Centrolene* Jimínez de la Espada

1872. *Centrolene* Jimínez de la Espada, p. 87 (type species, *Centrolene geckoideum* Espada).

Generic diagnosis.—Procoelous; arciferal pectoral girdle; disk-like intercalary cartilages present between ultimate and penultimate phalanges; terminal phalanges T-shaped.

This genus is readily distinguished from all hylid genera by the presence of T-shaped terminal phalanges. The large size and the large disks on fingers serve to differentiate it from *Centrolenella.* The single species of this genus is kown only from Colombia and Ecuador.

Centrolene geckoideum Jimínez de la Espada

PLATE 67G

1872. *Centrolene geckoideum* Jimínez de la Espada, p. 87 (type locality, Río

Napo, Ecuador).—Boulenger, 1882a, p. 188.—Noble, 1920, p. 441.—Nieden, 1923, p. 369.—Taylor, 1951, p. 33.—Goin, 1961, p. 103. 1964, p. 5.—Gorham, 1963, p. 24.

Diagnosis.—A large centrolenid (adult males attain head-body lengths of 77 mm.) with vomerine teeth, small eyes, and enlarged projecting humeral spines.

Centrolene geckoideum can be immediately distinguished from all other centrolenids by its large size and by the presence, in males, of large, protruding humeral spines that have their tips projecting well beyond the integument and fitting into antra in the enlarged forearms. Fresh specimens of *Centrolene geckoideum* from Colombia differ from all *Centrolenella* that we know by having the digital disk of the third finger large enough to cover the eye, whereas a feature of *Centrolenella* is the large eye—much larger than the digital disks. Also, *Centrolene geckoideum* is characterized by its short legs, with the heel of the adpressed leg reaching only to the eye, while in the other centrolenids it reaches or extends beyond the tip of the snout.

Description.—CNHM 69704, from Páramo Frontino, Urrao, Antioquia, Colombia. Vomerine teeth in two short, transverse series lying between the anterior halves of the choanae; tongue one-half as wide as mouth opening, nearly round, the posterior border free and very slightly notched; snout large, truncate when viewed from above and truncate in profile, the upper jaw not extending appreciably beyond lower; nostrils near tip of snout, their distance from end of snout about one-third that from eye, separated from each other by an interval equal to about two-thirds their distance from eye. Canthus rostralis moderately defined; loreal region slightly concave. Eye moderate for a tree frog this size, its diameter slightly less than its distance from nostril; interorbital diameter greater than width of upper eyelid, equal to the distance between nostrils. Tympanum very indistinct, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to three times its own diameter. Fingers fully webbed between digits 3 and 4 and with marginal fringes extending along sides of digits 1, 2, and 3 to their well-developed digital disks. The digital disks of fingers 2, 3, and 4 each large enough to completely cover an eye when placed over it. Fingers 3–4–2–1 in order of decreasing length. No external evidence of a pollex, the tip of fourth finger on right hand dissected to expose terminal phalanx. A well-developed, sharp spine is present on each humerus; it emerges from the chest integument in a hillock of what is apparently glandular tissue, and the sharp tip fits into an antrum on the median side of forearm just proximal to base of thumb. Toes completely webbed, third and fifth subequal, disk of fourth toe equal to diameter of eye; no distinct metatarsal tubercles; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to eye; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels just touch. Skin of upper parts highly glandular, warty tubercles particularly conspicuous on snout, including loreal and canthal regions, and on upper eyelids and occiput; skin of throat, chest, belly, and lower femur uniformly granular. A horizontal row of four distinct hyphen-shaped warts below the vent. External vocal sacs present in the form of a thin, deflated sac at the base of the angle of the jaw on each side.

Dimensions.—Head and body, 74.2 mm.; head length, 22.5 mm.; head width, 25.7 mm.; femur, 37.2 mm.; tibia, 38.5 mm.; heel-to-toe, 56.7 mm.; hand, 30 mm.

Color in alcohol.—A uniform brown above and pale brown below. Except as noted below, the dorsal and ventral surfaces of the limbs are the same color as the dorsum and venter respectively. Except for a few minute dark flecks in the sacral region of the back, the pattern consists solely of dark inky markings of the left limbs. Four narrow, transverse stripes cross the back of the hand just below the wrist—these four stripes being so close together as to give the appearance of a single dark band. On the left leg are a number of narrow, transverse, inky stripes across the tops of the digits and the ankle and a broader inky blob across the middle of the dorsal surface of the shank.

Variation.—Sexual dimorphism is noticeable. In the series of specimens from Urrao (CNHM 69703–8, four males and two females), the females not only are definitely shorter (60.4 and 61 mm.) than the males (70.7, 74.2, 76.4, and 77 mm.) in head-and-body length but are of a much lighter build. The diameter of the thigh in the females is no more than half the diameter of the thigh in the males, and the diameter of the forearm is no more than one-fourth that of the forearm in the males. A good idea of the size differential may be gained by the fact that the two females average 15 grams each (just as they are taken from the bottle) while the four males average 43 grams each.

The most striking element of the pattern variation is its asymmetry. In not a single specimen is the pattern symmetrical. The general ground color in all except one male is reduced in places leaving pale, washed-out patches of skin. In addition to this sort of ground color variation three of the four males (but neither female) have dark crossbands on the left leg but not on the right. In one male there are also dark bands across the left wrist.

Remarks.—Other than the series of fresh specimens from Urrao, we know of only one example (AMNH 1383), a female from Medellín, Antioquia. Compared to the fresh specimens at hand from Urrao, the Medellín frog seems somewhat mummified, but it is obviously the same species. As is the case with the two females from Urrao, the humeral spine is reduced and does not project through the skin and into an antrum in the forearm as it does in the males. The American Museum specimen seems to have more slender appendages, but this is most likely due to desiccation and shrinkage since the head-and-body length is 55.2 millimeters, compared to 60.7 and 61.8 millimeters in the two fresh females at hand.

The relatively small eyes alone are enough to set this off at once from any other large tree frog known to us.

It takes but a cursory examination of the large males of this species, with their well-developed spines, to convince one that Noble (1920) did well to set off the small, green (in life) centrolenids in a separate genus.

Specimens Examined

COLOMBIA

ANTIOQUIA: Páramo Frontino, Urrao, 3,000 m., CNHM 69703–8; Medellín, AMNH 1383.

Genus *Centrolenella* Noble

1920. *Centrolenella* Noble, p. 441 (type species, *Centrolenella antioquiensis* Noble).

Generic diagnosis.—Procoelous; arciferal pectoral girdle; disk-like intercalary cartilages present between the ultimate and penultimate phalanges; terminal phalanges T-shaped.

This genus is distinguished from *Centrolene* by the small disks on the tips of the fingers, which are much too small to cover the eye, and by its much smaller size.

Key to Colombian Species of *Centrolenella*

*a*¹. No vomerine teeth.
  *b*¹. Dorsum with ground color well developed (generally lavender in preservative) and much darker than ventral surfaces.
    *c*¹. Dorsum smooth, with no spiny, wart-like protuberances.
      *d*¹. No sharp line of demarcation between dorsal and ventral ground colors; web on lateral margin of third finger extending to base of penultimate phalanx. . . . . **C. antioquiensis**
      *d*². A sharp line of demarcation between dorsal and ventral ground colors; web on lateral margin of third finger extending only to middle of antepenultimate phalanx. . . . . **C. buckleyi**

c^2. Dorsum with numerous, sharp, spiny, wart like protuberances **C. johnelsi**

b^2. Dorsum pale like ventral surfaces (in preservative entire specimen uniform yellowish white) . . . . **C. fleischmanni**

a^2. Vomerine teeth present.

b^1. Dorsal pattern of light spots on a darker background.

c^1. Entire dorsal surface, except that of upper arms, rather heavily pigmented with numerous, randomly arranged, light spots on the top of head, dorsum, forearms, and hind limbs . . . . **C. medemi**

c^2. Dorsal surface lightly pigmented, particularly on top of thigh, and with very uniform and symmetrically placed white spots on head and dorsum but with none on dorsal surfaces of limbs . **C. grandisonae**

b^2. Dorsal pattern uniform . . . . **C. parabambae**

Centrolenella antioquiensis Noble

FIGURE 49

1920. *Centrolenella antioquiensis* Noble, p. 442 (type locality, Colombia, Antioquia, 14 mi. north of Mesopotamia, Santa Rita Creek); 1926a, p. 17.—Taylor, 1951, p. 34.—Lutz and Kloss, 1952, p. 660, 662.—Goin, 1964, p. 6.

1963. *Centrolene antioquiensis.*—Gorham, 1963, p. 24.

Diagnosis.—A centrolenid without vomerine teeth, with a web between fingers 2 and 3 and a well-developed web between fingers 3 and 4, and with no sharp line of demarcation between the dorsal and ventral ground color.

This species may be distinguished from all Colombian centrolenids except *buckleyi*, *fleischmanni* and *johnelsi* by the absence of vomerine teeth. From *buckleyi* it may be distinguished by the more extensive webbing between the toes and the more prominently developed humeral spine. From *fleischmanni* it differs in having the dorsum heavily pigmented. From *johnelsi* it differs in lacking the numerous spiny wart-like protuberances on the dorsal surfaces.

Description.—AMNH 1353, from Santa Rita Creek, 14 miles north of Mesopotamia, Antioquia, Colombia. Vomerine teeth absent; choanae small, rounded, separated by a distance about five times their own diameters, tongue two-thirds as wide as mouth opening, broadly rounded, its posterior border free and shallowly notched. Snout short, rounded when viewed from above, truncate and slightly sloping in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis slightly defined; loreal region slightly concave and somewhat oblique, the upper lip flaring out slightly below it. Eye moderate, rather prominent, its diameter one-third as great as its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal to the distance between nostrils. Tympanum moderately distinct, about one-third the diameter of eye, separated from eye by a distance nearly equal to one-half its own diameter. Webbing between fingers 3 and 4 reaching to base of penultimate phalanges of both, a trace of web between fingers 2 and 3, fourth finger considerably longer than second, just reaching to base of disk of third which is about 1½ times the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; humeral spine palpable. Toes more than one-half webbed, the web on fourth toe reaching the base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe just covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge, no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow slightly overlap; when hind legs are bent at right angles to body, heels slightly overlap. No patagium. Skin of upper parts smooth; no distinct narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult male, vocal sac apparently internal. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 21.7 mm.; head length, 5.8 mm.;

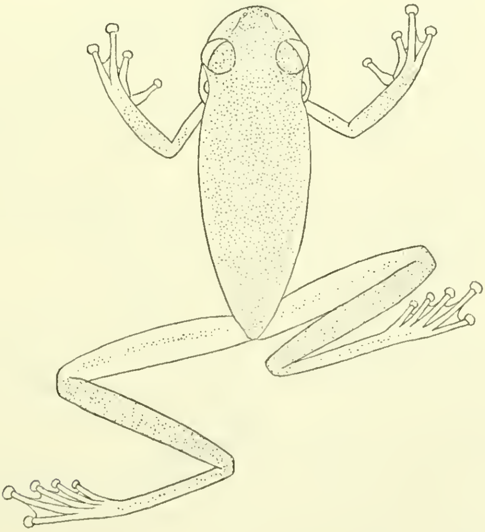

FIGURE 49.—*Centrolenella antioquiensis,* AMNH 1353 (× 2).

head width, 7.2 mm.; femur, 11.3 mm.; tibia, 12 mm.; heel-to-toe, 15.4 mm.; hand, 6 mm.

Color in alcohol.—Lavender above, pale below. The dorsal lavender color fades gradually along the side with no sharp line of demarcation. The dorsal ground color is absent from the margin of the upper lip. On the limbs the dorsal color is developed as follows: on the forelimb it is present on the upper surfaces of the upper and lower arms, the hand, and fingers three and four, including the tip of the disk of finger four; on the hind limbs the pigment is present in the upper surface of the thigh and shank, the foot, and fingers four and five, out to and including the top of the disks, and there is a trace of pigment on top of third toe. The ventral surfaces of the body and limbs are immaculate.

Remarks.—This form is certainly closely related to *Centrolenella buckleyi*. After examination of 16 specimens of *buckleyi* ranging from Venezuela to Ecuador, the only characters that seem to maintain *antioquiensis* are the more extensively developed webs between the fingers and the more heavily developed spine on the humerus.

Specimens Examined

COLOMBIA

Antioquia: Fourteen miles north of Mesopotamia, Santa Rita Creek, AMNH 1354 (type), 1353, 1356 (paratypes); Puerto Berrio, MZUM 67653; Sonsón, MCZ 16037.

Centrolenella buckleyi (Boulenger)

Figure 50

1882. *Hylella buckleyi* Boulenger, 1882a, p. 420, pl. 25, fig. 5 (type locality' Intac, eastern Ecuador [actually on the western slopes]).

1920. *Centrolenella buckleyi*.—Noble, 1920, p. 442; 1926a, p. 17.—Lutz and Kloss, 1952, p. 662.—Goin, 1964, p. 6.

1923. *Hyla purpurea* Nieden, p. 267 (substitute name for *Hyella buckleyi* Boulenger).

1951. *Cochranella buckleyi*.—Taylor, 1951, p. 35.—Taylor and Cochran, 1953, p. 1628.—Goin, 1961, p. 100.—Gorham, 1963, p. 24.—Rivero, 1964b, p. 311.

1963. *Centrolene buckeyi*.—Rivero, 1963a, p. 93.

Diagnosis.—A centrolenid without vomerine teeth; with a web from the middle of antepenultimate phalanx of third finger to base of penultimate phalanx of fourth; tympanum present but somewhat indistinct; dorsal ground color purple with a sharp line of demarcation between the dorsal and ventral ground colors.

Centrolenella buckleyi can be distinguished from all Colombian centrolenids except *antioquiensis*, *fleischmanni*, and *johnelsi* by the absence of vomerine teeth. The absence (usually) of well-developed humeral spines, the lack of a sharp line of demarcation between the dorsal and ventral colors, and the reduced webbing between the fingers serve to distinguish it from *antioquiensis,* while the heavily pigmented dorsum distinguishes it from *fleischmanni.* From *johnelsi* it differs in lacking the numerous spiny wart-like protuberances on the dorsal surface.

Description.—CNHM 54722, from Guaitarilla, Nariño, Colombia. Vomerine teeth absent, choanae small, rounded, separated by a distance about five times their own diameters; tongue three-fourths as wide as mouth opening, broadly cordiform, its posterior border free and distinctly notched. Snout moderate, broadly rounded when viewed from above, slightly rounded in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-half that from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis poorly defined; loreal region slightly concave and somewhat oblique, the upper lip flaring out below it. Eye neither large nor prominent, its diameter slightly greater than

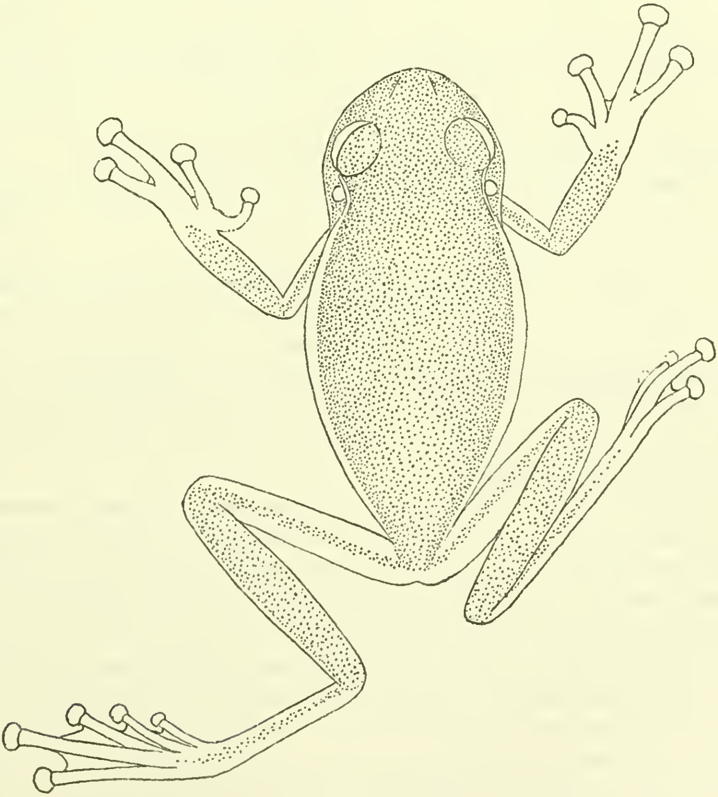

FIGURE 50.—*Centrolenella buckleyi,* CNHM 54722 (same size).

its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is about equal the distance between nostrils. Tympanum rather indistinct, about one-fourth the diameter of eye, separated from eye by a distance about equal to one-half its own diameter. Fingers 3 and 4 webbed at base, fourth finger considerably longer than second, reaching to disk of third which covers about twice the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; humeral spine barely palpable. Toes slightly more than one-half webbed, the web on fourth toe nearly reaching the base of penultimate phalanx, third and fifth toes subequal, disk of fourth toe slightly larger than tympanic area; a distinct oval inner and a smaller, very indistinct, rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little wider than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow fail to meet on this gravid individual; when hind legs are bent at right angles to body, heels overlap slightly. No patagium. Skin of upper parts smooth; a rather narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh somewhat granular; no trace of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 33 mm.; head length, 10.9 mm.; head width, 11.7 mm.; femur, 16.6 mm.; tibia, 17.5 mm.; heel-to-toe, 25 mm.; hand, 10.4 mm.

Color in alcohol.—A uniform, rather dark purple above, pale below. Along the sides there is a rather sharp line of demarcation between the dorsal and ventral color. The margin of the upper lip is pale. The dorsal ground color occurs on the upper surface of the upper and lower arm and the base of hands; as a narrow stripe along the upper surface of the thigh and rather extensively on the upper surface of the shank and foot.

Variation.—The material at hand seems to indicate a somewhat variable species but correlation of the variability is difficult. Much of the variation seems to be caused by age, for the smaller specimens are more slender and graceful looking than are the larger (and older?) specimens. The older specimens particularly seem broader through the waist, and they usually are as wide as or wider in the midbody region than in the head. Generally also the smaller specimens are somewhat paler than the larger, but even in these the line of demarcation between the dorsal ground color and the pale venter is rather sharp. Southern individuals seem to have, on the average, a little more web between the third and fourth fingers than do those from the north, but the material is not adequate to determine the significance of this variation. There is considerable variation in the degree of development of the humeral spine. Some of the males have the humeral spine fairly well developed and can be distinguished from *C. antioquiensis* by this character only with difficulty. Other individuals, particularly old females, may lack any palpable evidence of humeral spines.

Superimposed over all the variations discussed above is variation brought about by preservation and storage. This variation is rather extensive, and some of the material is rather soft or otherwise inadequate for thorough study.

The largest male at hand (MZUM 83652) measures 27.8 millimeters in head-and-body length, while the largest female (CNHM 54722) measures 33 millimeters.

Remarks.—A search for the types of this species in the collections of the British Museum produced one bottle (BM 80.12.5.201 [947.2.-22.55]) containing soup and a few odd bones and another bottle (BM 78.1.25.16 [1947.2.22.54]) containing alcohol, the original label, and a note that the specimen had been X-rayed in 1955. There are, however, data concerning Boulenger's concept of this species in addition to his type description and figure. Two well-preserved specimens (BM 1903.10.30.24, 1905.5.31.94) from Escorial, Venezuela, that were identified by Boulenger as his *H. buckleyi* are so labeled by Boulenger in his own handwriting. These specimens, which fit the original description and illustration perfectly, leave no doubt in our minds as to the species described by Boulenger.

Three centrolenids in the northern Andean region that have rather uniform dark purple dorsa seem to have been extraordinarily confused in collections. These are *buckleyi*, *antioquiensis*, and *parabambae*. The confusion seems to have resulted in part from a lack of good specimens for comparisons and in part from the widespread belief that the presence or absence of vomerine teeth in this group is without significance.

After study of all available type material and direct comparison of the three forms we now believe that each is distinct and that the presence or absence of vomerine teeth serves as a valid character on which to separate the species. Furthermore, *Centrolenella buckleyi* has a different habitus from the others and usually can be recognized at a glance. Both *parabambae* and *antioquiensis* seem to have somewhat slender, tapering bodies, while *buckleyi* gives the appearance of being wide and flattened. In preservation, at least, the midbody of *buckleyi* usually is definitely flattened dorsoventrally and, more often than not, is wider than the head. The other two species with dark purple dorsa have more slender, graceful-looking bodies that are not flattened dorsoventrally and that are seldom, if ever, wider than the head.

Specimens Examined

COLOMBIA

Boyacá: Guaicaramo, USNM 152098–9.

Cauca: Moscopán, MZUM 121033 (5); near Puracé, USNM 151930–7.

Nariño: Guaitarilla, CNHM 54720–2.

Vaupés(?): Lower Río Apaporis, FM 89 (2).

ECUADOR: Cinincay, AMNH 17464; Imbabura, MZUM 83652, 83654; Llave Pongo, AMNH 20141; Páramo, AMNH 20504; Río Zamora, Sabanilla, AMNH 13530.

VENEZUELA: Culata, BM 1905.5.31.89–92; Escorial, BM 1903.10.30.24, 1905.5.31.94; Mérida, BM 1905.5.3.93, MCZ 2526.

***Centrolenella parabambae* (Boulenger)**

Figure 51

1898. *Hyla parabambae* Boulenger, 1898a, p. 125 (type locality, Paramba, northwestern Ecuador).—Nieden, 1923, p. 265.

1920. *Centrolenella parambae*.—Noble, 1920, p. 442; 1926a, p. 17.—Goin, 1964, p. 6.

1952. *Centrolenella parabambae*.—Lutz and Kloss, 1952, p. 662.

1951. *Cochranella parambae*.—Taylor, 1951, p. 35.

1961. *Cochranella parabambae*.—Goin, 1961, p. 102.

1963. *Centrolene parabambae*.—Gorham, 1963, p. 24.

Diagnosis.—A centrolenid with vomerine teeth in transverse series between the choanae, without well-developed humeral spines and with the dorsal ground color fading gradually into the ventral pale color.

This species can be distinguished from all Colombian centrolenids except *Centrolene geckoideum*, *Centrolenella grandisonae*, and *C. medemi* by the presence of vomerine teeth. From *Centrolene geckoideum* it may be distinguished by the lack of prominent humeral spines and by the relatively larger eyes (the disk of third finger does not cover them). From the latter two species it differs by the lack of definitive light spots on the back.

Description.—CNHM 81362, from Pico Renjifo, 1,500 m., Serranía de La Macarena, Meta, Colombia. Vomerine teeth in two short, transverse series, lying between the moderate-sized, rounded choanae; tongue two-thirds as wide as mouth opening, broadly cordiform, its posterior border slightly free and very shallowly notched. Snout moderate, broadly U-shaped when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout about equal to their distance from eye, separated from each other by an interval equal to about their distance from eye. Canthus rostralis fairly well defined; loreal region concave and rather oblique, the upper lip flaring out below it. Eye moderate, rather prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum not strongly distinct, about one-fourth the diameter of eye, separated from eye by a distance nearly equal to its own diameter. Fingers slightly webbed at base, fourth finger considerably longer than second, just reaching the disk of third which is a little greater in size than the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; no humeral spine palpable. Toes slightly more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx; third and fifth toes subequal, disk of fourth toe about covering the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body somewhat elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches almost to nostril; when limbs are laid along the side, knee and elbow overlap somewhat; when hind legs are bent at right angles to body, heels overlap somewhat. No patagium. Skin of upper parts rather smooth; a rather indistinct glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; no apparent trace of a skinfold across chest; adult female, no vocal

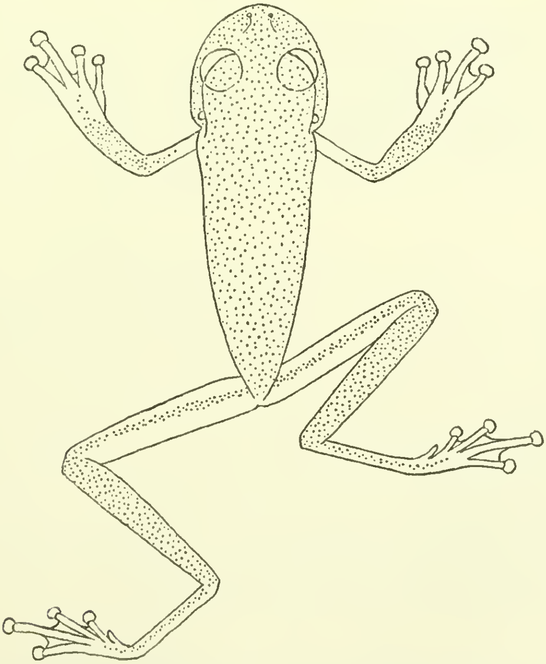

FIGURE 51.—*Centrolenella parabambae*, CNHM 81362 (× 2).

sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 25.7 mm.; head length, 8.7 mm.; head width, 8.7 mm.; femur, 12.6 mm.; tibia, 13.7 mm.; heel-to-toe, 16.3 mm.; hand, 7 mm.

Color in alcohol.—A lavender brown above, pale below. The only semblance of pattern is in the two upper eyelids, which are dark purple, and in two purplish areas on the dorsolateral region above the region of the elbows. There is no sharp line of distinction between the dorsal ground color and the ventral pale color.

Variation.—All specimens of this species examined seem to be remarkably uniform in all essential characters. The pattern is rather uniform throughout the group, the most conspicuous elements of it being the darker eyelids and the darker blotches along the dorsolateral sides of the back in the region above where the elbows lie. The specimen described above was directly compared with the type and the two were found to be conspecific and practically identical.

Although *Centrolenella parabambae* has somewhat the same dorsal color as *C. antioquiensis* and *C. buckleyi*, its vomerine teeth and general build serve to distinguish it readily.

Specimens Examined

COLOMBIA
  ANTIOQUIA: Medellín, AMNH 1355.
  CAQUETÁ: Río Mecaya, CNHM 69739.
  META: Serranía de La Macarena, Pico Renjifo, 1,500 m., CNHM 81362.
ECUADOR: Paramba, BM 98.4.28.163 [1947.2.13.13] (type); El Topo, Río Pastaza, BM 1912.11.1.69–70.
PANAMA: Darién: Laguna, MNHUK 77566–70; Tacarcuna, MNHUK 77571–73.
VENEZUELA: Mérida, MCZ 2526.

Centrolenella fleischmanni (Boettger)

1893. *Hylella fleischmanni* Boettger, pp. 251–2 (type locality, Costa Rica, San José).—Günther, 1901, p. 287.—Mertens, 1922, p. 163.—Nieden, 1923, p. 255.
1904. *Hylella cappellei* Lidth, p. 94 (type locality, Suriname).—Nieden, 1923, p. 309.
1924. *Centrolenella fleischmanni.*—Noble, 1924, p. 67.—Taylor, 1949, p. 258.—Goin, 1964, p. 1.
1926. *Centrolenella cappellei.*—Noble, 1926a, p. 18.
1931. *Centrolene fleishmanni.*—Dunn, 1931, p. 415; 1931a, p. 399; 1933, p. 74.
1951. *Cochranella fleishmanni.*—Taylor, 1951, p. 34; 1952, p. 777.—Duellman and Tulecke, 1960, p. 393.—Gorham, 1963, p. 24.
1964. *Cochranella fleishmanni.*—Rivero, 1964b, p. 311.

Diagnosis.—A centrolenid without distinct pattern (in preservative); without vomerine teeth; with reduced webbing between the first and second and between the second and third fingers, but with the webbing between the third and fourth fingers extending well onto the base of the penultimate phalanx of both of these digits. The choanae are small and rounded and separated from each other by a distance equal to nearly three times their own diameter. The upper eyelids appear whitish when viewed from above in the larger specimens; in the small individuals they appear darker. When the hind leg is extended anteriorly along the side, the heel reaches to tip of the snout or beyond. The tympanum is weakly evident externally and is about one-fourth the diameter of the eye and separated from the base of the eyelid by about one-half its own diameter.

The absence of vomerine teeth distinguishes *Centrolenella fleischmanni* from all other centrolenids known from northern South America except *cochranae, buckleyi, griffithsi, antioquiensis, ocellata, johnelsi,* and *petersi*. It differs from *cochranae, buckleyi,* and *griffithsi* by having the web extending to the bases of the penultimate phalanges of the third and fourth fingers; from *antioquienois* by having the dorsum pale rather than heavily pigmented; from *ocellata* by the absence of a dorsal pattern (the very dark dorsum of *ocellata* is marked with distinct, white-centered ocelli); and from *johnelsi* by lacking the numerous spiny wart-like protuberances on the dorsal surface. It differs from *petersi* in the following respects: the web reaches only to the penultimate phalanx of the fourth toe or does not reach it at all (in *petersi* it extends well up onto the penultimate phalanx); the disk of fourth toe practically covers the indistinct tympanum (in *petersi* the digital disks are reduced, with the disk of fourth toe covering only about half the distinct tympanum); and the specks of pigment have no semblance of a pattern (in *petersi,* small circles of pigment specks form weak ocelli-like marks on dorsal surfaces of back, forearms, thighs, and shanks).

Description.—NMS 3752 (paratype), San José, Costa Rica. No vomerine teeth. Choanae small, rounded, separated by a distance equal to about 2½ times the diameter of a choana. Tongue two-thirds as wide as mouth opening, rounded, its posterior border fused and unnotched. Snout short, rounded when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, slightly projecting, their distance from end of snout nearly one-half that from eye, separated from each other by an interval equal to about three-fourths their distance from eye. Canthus rostralis scarcely defined; loreal region concave and oblique, the upper lip flaring out appreciably below it. Eye moderate in size, prominent, its diameter equal to its distance from nostril; palpebral membrane not reticulare; interorbital distance half again as great as width of upper eyelid, which is about equal the distance between nostrils. Tympanum not very distinct, about one-fourth the diameter of eye, separated from orbit by a distance equal to about one-half its own diameter. Fingers webbed at base, web extending from base of penultimate phalanx of third finger to base of penultimate phalanx of fourth, webbed only at base between second and third and first and second fingers; fourth finger considerably longer than second, reaching to disk of third which about covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge. Toes slightly more than one-half webbed, the web reaching to distal end of antepenultimate phalanx of fourth toe and the middle of the penultimate phalanges of the third and fifth toes; third and fifth toes subequal; disk of fourth toe covering about two-thirds of the tympanic area; a distinct oval inner and a much smaller but distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches to tip of snout; when limbs are laid along the side, knee and elbow overlap considerably; when hind legs are bent at right angles to body, heels overlap slightly. No patagium present. Skin of upper parts rather smooth, no apparent glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and finely granular, no trace of a skinfold across chest; adult male, no vocal sac apparent. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 19.2 mm.; head length, 5.7 mm.; head width, 7 mm.; femur, 10.8 mm.; tibia, 10.8 mm.; heel-to-toe, 14.2 mm.; hand, 6.6 mm.

Color in alcohol.—Generally a pale yellowish white above and below.

Color in life.—Dorsum light green with scattered, roundish yellow-white spots. This color and pattern usually fade rapidly in preservative.

Variation.—*C. fleischmanni* is rather uniform in structural characters. Most of the variation discernible in any series other than as to the size of the individuals seems to be a function of how long they have been preserved and hence how much they have faded. In large individuals the upper eyelids may appear whiter than the rest of the dorsum, while in smaller individuals they may be no whiter or even darker. Under magnification tiny flecks of pigment may be seen on the dorsum but these form no semblance of a pattern.

Remarks.—Although we have no record of *C. fleischmanni* from Colombia, we include it in the fauna of that country since it occurs in both Venezuela and Suriname to the east and in Panama to the west, and its occurrence in Colombia seems to be a certainty.

Specimens Examined

COSTA RICA: San José, NMS 3752 (paratype), USNM 29927–8, 77049–51;

La Palma, MCZ 152881, USNM 75072, 77034; San Isidro, USNM 77040–1; Turrialba, Cartago, USNM 29957, MNHUK 65201–20. (Color transparencies: Tapanti, Cartago, MNHUK 65189; Laguna Monte Alegre, Alajuela, MNHUK 65186; Hereida, 2 km. north of Cinco Esquinias, MNHUK 65232.)

PANAMA: Canal Zone, USNM 37864; Fort Davis, Canal Zone, MCZ 11780; Barro Colorado Island, Canal Zone, MCZ 15245; El Valle de Antón, AMNH 59593–5; Laguna, Darién, MNHUK 77535; Tacarcuna, Darién, MNHUK 77536–9; Río Esnapé, MCZ 9175.

VENEZUELA: Río Chacaito, Miranda, CM 22796, USNM 12889–93; Los Canales, Naiguata, Miranda, CM 22783–4, USNM 117523–4, 128796–9; Curupao, Miranda, USNM 128888; Aragua, USNM 128800; Río Cortiza, Distrito Federal, USNM 128801; near Turumiguiri, Sucre, CM 9122; Santa Inés, Monagas, UCV 3020; Guachoro, Monagas, UCV 3018 (4).

ECUADOR: Guevedo, USNM 60520.

SURINAME: RNH 4463 (type of *Hylella cappellei*).

***Centrolenella medemi*, new species**

FIGURE 52

Holotype.—USNM 152277, collected at Puerto Asís, upper Río Putumayo, Putumayo, Colombia, by Fred Medem, October 22, 1958.

Diagnosis.—A centrolenid with vomerine teeth and with a dorsal pattern of numerous, randomly placed white spots on top of head, dorsum, and upper surfaces of limbs.

This new species may be distinguished from all Colombian *Centrolenella* except *parabambae* and *grandisonae* by the presence of vomerine teeth; and from those two species it differs by having light spots on the dorsal surfaces of forearms, thighs, and shanks.

Description of holotype.—Vomerine teeth in two short, somewhat transverse series, lying close together between the small, rounded choanae; tongue one-half as wide as mouth opening, rounded, its posterior border very slightly free and unnotched. Snout short, rounded when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils superior and anterior, slightly projecting, their distance from end of snout nearly equal to their distance from eye, separated from each other by an interval as great as that from eye. Canthus rostralis slightly defined; loreal region flat and somewhat oblique, the upper lip flaring out below it. Eye large, very prominent, its diameter nearly twice its distance from nostril; palpebral membrane not reticulate; interorbital distance slightly greater than width of upper eyelid, which is slightly less than distance between nostrils. Tympanum very indistinct, about one-fourth the diameter of eye, separated from eye by a distance equal to one-half its own diameter. Fingers webbed, the web extending from the middle of the penultimate phalanx of fourth finger to base of penultimate phalanx of third and from base of antepenultimate of third to base of penultimate of fourth; fourth considerably longer than second, just reaching to disk of third which more than covers the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; humeral spine palpable but not protruding. Toes completely webbed, the web extending as a narrow margin to base of disk of fourth toe; third and fifth toes subequal, disk of fourth toe about covering the tympanic area; a distinct oval inner and a smaller indistinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body moderately elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches well beyond tip of snout; when limbs are laid along the side, knee reaches axilla; when hind legs are bent at right angles to body, heels considerably overlap. No patagium present. Skin of upper parts smooth. No discernible narrow glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and very finely granular; traces of a skinfold across chest; adult female, no vocal sac. Skin of head not co-ossified with skull, roof of skull not exostosed.

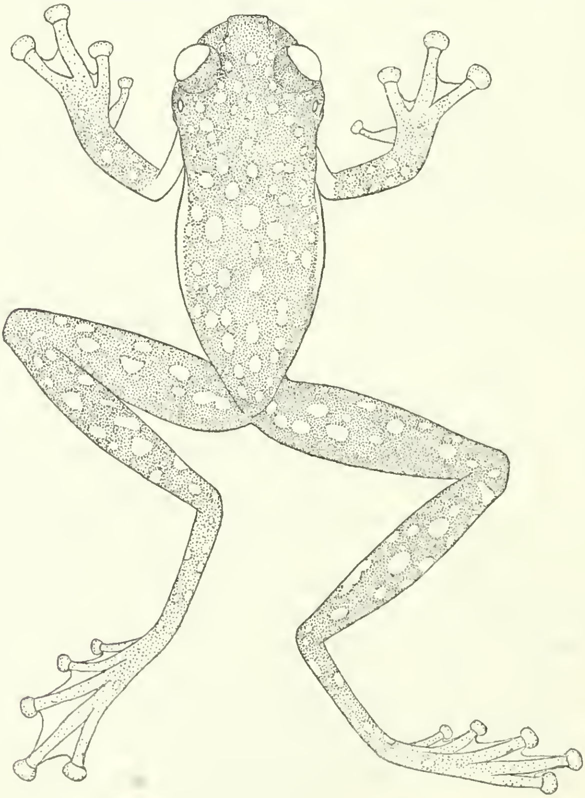

Figure 52.—*Centrolenella medemi*, holotype, USNM 152277 (× 2).

Dimensions.—Head and body, 26.1 mm.; head length, 8.6 mm.; head width, 10.3 mm.; femur, 17.1 mm.; tibia, 18.7 mm.; heel-to-toe, 23.3 mm.; hand, 10.1 mm.

Color in alcohol.—Top of head, dorsum, top of forearm and hand, top of thigh, shank and foot all a very dark gray with just a hint of blue in it. The dark gray ground color marked with thickly scattered, roundish, pale spots which average about one millimeter in diameter. The entire ventral surface is a pale cadaverish gray.

Remarks.—Since only one specimen is known of this distinctive little frog, nothing can be reported on variation.

We take pleasure in dedicating this species to Dr. Fred Medem, who discovered it.

***Centrolenella grandisonae*, new species**

FIGURE 53

Holotype.—BM 1910.7.11.68, collected at Pueblo Rico, Caldas, southwestern Colombia, 5,000 feet altitude, by H. G. Palmer.

Diagnosis.—A centrolenid with vomerine teeth, well-developed humeral spines, and a distinctive pattern of white spots on the back.

This new species can be distinguished from all Colombian *Centrolenella* except *medemi* and *parabambae* by the presence of vomerine teeth. It can be distinguished from *medemi* by having the dorsal light spots restricted to a definitive pattern on the top of head and dorsum but absent on the upper surfaces of the limbs, and from *parabambae* by having a dorsal pattern of light spots rather than being uniformly pigmented above.

Description of holotype.—Vomerine teeth present in two short, fleshy mounds lying between the rounded choanae, two teeth in left mound, one in right; tongue not quite one-half as wide as mouth opening, broadly rounded, its posterior border not free and unnotched; snout moderate, somewhat U-shaped when viewed from above, truncate in profile, the upper jaw extending but slightly beyond lower; nostrils more lateral than superior, not projecting, their distance from end of snout about one-half their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis slightly defined; loreal region concave and quite oblique, the upper lip flaring out below it. Eye large, very prominent, its diameter greater than its distance from nostril; interorbital distance about equal to width of upper eyelid, which is relatively wide and slightly greater than distance between nostrils. Tympanum distinct, about one-fourth the diameter of eye, separated from eye by a distance about equal to its own diameter. Fingers webbed at base, web extending from distal third of antepenultimate phalanx of third finger to base of penultimate phalanx of fourth; fourth considerably longer than second, just reaching to disk of third, which is twice the diameter of the tympanic area; no projecting rudiment of a pollex; a moderately well-developed, protruding humeral spine. Toes slightly more than one-half webbed, the web on fourth toe reaching base of penultimate phalanx, third and fifth toes subequal, diameter of disk of fourth toe about one-half again as great as the diameter of the tympanic area; a somewhat dried oval inner and a smaller, even-less-distinct rounded outer matatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region distinctly narrower than greatest width of head; when hind leg is adpressed, heel reaches tip of snout; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels overlap. No patagium present. Skin of upper parts smooth; skin of chin and belly smooth, that of posterior throat region and anterior pectoral region uniformly and heavily wrinkled into pronounced vermiculoid folds; underside of thighs smooth; no apparent traces of a skinfold across chest; adult male, vocal sac subgular. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 27.4 mm.; head length, 8.8 mm.; head width, 9.6 mm.; femur, 15.3 mm.; tibia, 16.4 mm.; heel-to-toe, 20.7 mm.; hand 8 mm.

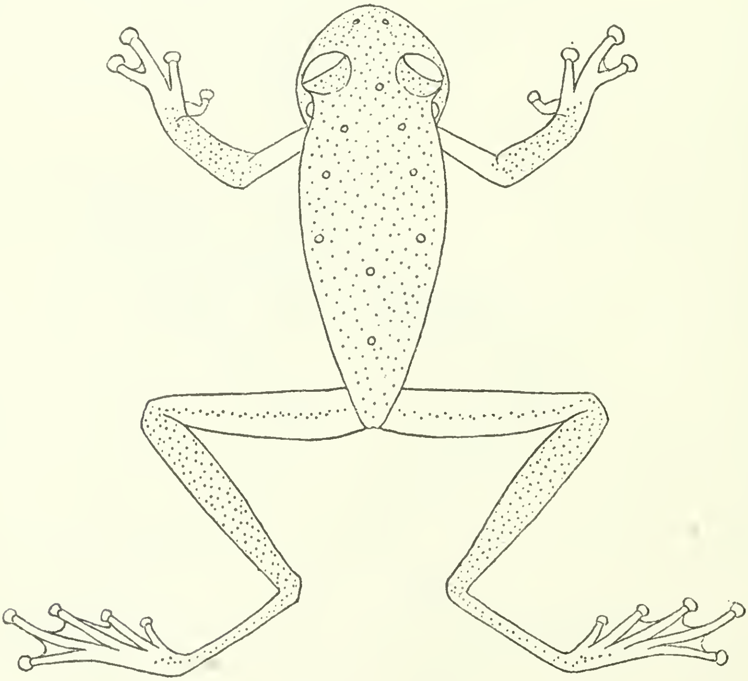

FIGURE 53.—*Centrolenella grandisonae*, holotype, BM 1910.7.11.68 (× 2).

Color in alcohol.—Dorsum a pale lavender cream with no sharp line of demarcation between dorsal ground color and the pale ventral ground color. Although the specimen is now somewhat faded, traces of the dorsal color are evident on the upper surfaces of the forearms and shanks. The dorsal surface is marked by nine distinct, rounded white spots: three unpaired median ones—one between the eyes, one above the sacral vertebra, and one above the middle of the urostyle—and three pairs of spots along the back—one pair behind the eyes, one pair above the axilla, and one pair just anterior to the sacral vertebra.

Remarks.—The described specimen has been in a bottle labeled *Centrolene prosoblepon* that has been in the British Museum collections for half a centruy. We are not the first to recognize the specimen as a novelty, for the bottle contains the following note in the handwriting of the late E. R. Dunn: "not c. prosoblepon, sp. nov.? Dunn."

We take pleasure in dedicating this species to Miss Alice G. C. Grandison of the British Museum.

***Centrolenella johnelsi*, new species**

FIGURE 54

Holotype.—MLS 432, collected at San Pedro, north of Medellín, Antioquia, Colombia, by Hno. Nicéforo María.

Diagnosis.—A centrolenid without vomerine teeth, with a heavily pigmented dorsum thickly beset with distinct, pointed, white tubercles.

This new species can be distinguished from all Colombian centrolenids except *antioquiensis*, *buckleyi*, and *fleischmanni* by the absence of vomerine teeth; from those three species it can be distinguished by having densely placed, white, spiny protuberances on the dorsal surfaces. From *antioquiensis*, to which it is most similar in build, it can be further distinguished by having reduced webbing between the fingers.

Description of holotype.—Vomerine teeth absent; choanae small, rounded, separated from each other by an interval equal to about four times their own diameter; tongue small, about two-fifths as wide as mouth opening; pear-shaped, its posterior border fused and unnotched. Snout short, rounded, truncate in profile, the upper jaw extending just slightly beyond lower; nostrils not at all superior and more anterior than lateral, slightly projecting, their distance from end of snout about one-half their distance from eye, separated from each other by an interval equal to their distance from eye. Canthus rostralis slightly defined; loreal region concave and somewhat oblique, the upper lip flaring out distinctly below it. Eye large, very prominent, its diameter more than its distance from nostril; palpebral membrane not reticulate; interorbital distance about equal to width of upper eyelid, which is relatively wide and distinctly wider than distance between nostrils. Tympanum very distinct for a *Centrolenella*, about one-fourth the diameter of eye, separated from orbit by a distance equal to one-fourth its own diameter. Fingers with no web between first and second, a trace of web between second and third, and the web between third and fourth extending to the proximal one-third of antepenultimate phalanx of third finger and to the distal end of antepenultimate phalanx of fourth; fingers 3–4–2–1 in order of decreasing length; fourth considerably longer than second, just reaching to disk of third which covers about half again the tympanic area; no projecting rudiment of a pollex; no ulnar ridge; humeral spine well-developed and prominent but not penetrating the skin. Toes slightly more than one-half webbed, the web on fourth toe reaching to middle of antepenultimate phalanx, third and fifth toes subequal, disk of fourth toe 1⅓ times the tympanic area; a distinct oval inner and a smaller but equally distinct rounded outer metatarsal tubercle; no tarsal ridge; no dermal appendage on heel. Body not elongate, in postaxillary region a little narrower than greatest width of head; when hind leg is adpressed, heel reaches to tip of snout; when limbs are laid along the side, knee and elbow considerably overlap; when hind legs are bent at right angles to body, heels overlap. No patagium present. Skin of upper parts soft and thin, as is typical

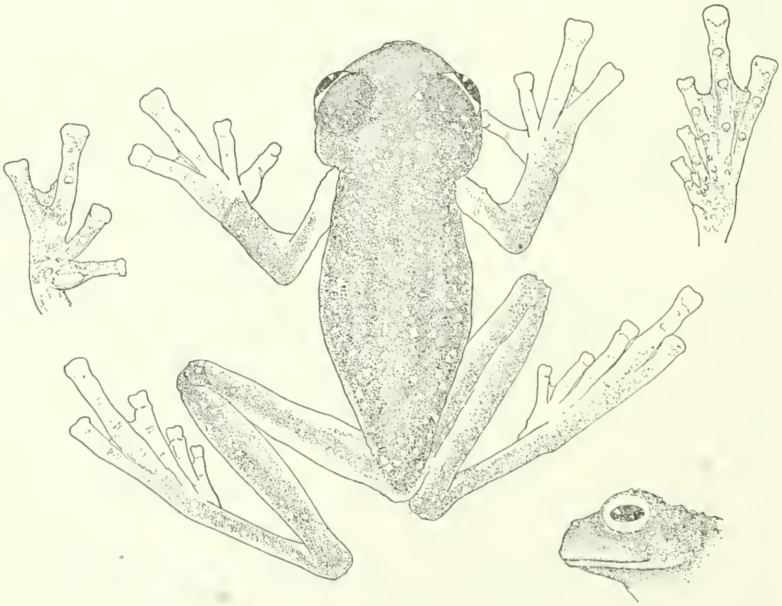

FIGURE 54.—*Centrolenella johnelsi*, holotype, MLS 432 (× 2).

of *Centrolenella*, but rather thickly beset with distinct, pointed, whitish, wart-like structures that are present on the back, upper eyelids, sides of head and tympani, and dorsal surfaces of arms, legs, and feet. No glandular ridge encircling upper part of tympanum; skin of throat and chest smooth, that of belly and lower surface of thigh uniformly and coarsely granular; no traces of a skinfold across chest; adult male, vocal sac slightly distended. Skin of head not co-ossified with skull, roof of skull not exostosed.

Dimensions.—Head and body, 29.3 mm.; head length, 9.2 mm.; head width, 10.1 mm.; femur, 16 mm.; tibia, 16.5 mm.; heel-to-toe, 22 mm.

Color in alcohol.—Top of head and dorsum purplish gray. The dorsal ground color extends as a narrow stripe along the upper arm, then expands to cover the entire dorsal surface of the forearm, and extends onto the base of the fourth finger. On the hind limb the dorsal ground color extends as a narrow stripe along the dorsal surface of the thigh, then expands to cover the entire dorsal surface of the shank and foot, and extends onto the dorsal surface of the fourth and fifth toes. The sharp, wart-like protuberances, which are thickly sprinkled over all of the pigmented dorsal surfaces except the face, are pearly white in color. Ventral surfaces pale.

Remarks.—This species is closest geographically, and perhaps phylogentically, to *antioquiensis.* In build, it is somewhat similar to the latter species but differs from it in having larger eyes, large digital disks, reduced finger webbing, and sharp, white spines on the dorsal surfaces. In this latter character it differs from any centrolenid known to us.

We dedicate this species to Dr. Alf G. Johnels, curator of the Naturhistoriska Riksmuseum, Stockholm, Sweden, who has been very kind to us.

Collection Localities in Colombia

Listed below in alphabetical order are all of the localities in Colombia from which we have seen frogs, Names of rivers, páramos, sierras, bays, etc., are given under the specific part of the name. For example, "Río Magdalena" is listed "Magdalena, Río." Sometimes, in order to avoid confusing future users of this gazetteer, when the same name appears in several different political subdivisions we have included localities from which we do not have specimens; however, we have not attempted to include all duplicate names. Latitudes and longitudes are approximate. Most were obtained by measuring with calipers from the locality to the appropriate latitude and longitude lines on the *Mapa Físico Político* (published by the Republic of Colombia in

1958). Some were taken from the *Preliminary NIS Gazetteer of Colombia* (published by the Central Intelligence Agency, Washington, D.C., in 1953), which contains the official standard names approved by the United States Board on Geographic Names, and these names have been followed in the present listing.

Locality	*Latitude and Longitude*	*Territorial Unit*
Acacías	3°59′N., 73°46′W.	Meta
Acevedo	1°49′N., 75°52′W.	Huila
Aquablanca (19 km. north of Cúcuta)	8°05′N., 72°19′W.	Norte de Santander
Agua Clara	—	Chocó
Aguadita (near Fusagasugá, which see)	—	Cundinamarca
Aguas Claras, Río (tributary of Río Suaza)	—	Huila
Albán	4°52′N., 74°28′W.	Cundinamarca
Albán	1°18′N., 77°35′W.	Nariño
Albán	4°47′N., 76°11′W.	Valle
Almorzadero, Páramo del	6°59′N., 72°42′W.	Santander
Altamira (on road from Puracé to La Plata)	2°15′N., 76°27′W.	Cauca
Amanavén	4°04′N., 67°45′W.	Vichada
Amazonas, Río	—	Between Amazonas and Brazil
Anchicayá, Río (enters Bahía de Buenaventura)	—	Valle
Andagoya	5°06′N., 76°42′W.	Chocó
Andes	5°39′N., 75°53′W.	Antioquia
Angelópolis	6°07′N., 75°42′W.	Antioquia
Angostura No. 1 (narrows, Río Guayabero)	2°17′N., 73°58′W.	Meta
Anolaima	4°45′N., 74°27′W.	Cundinamarca
Apaporis, Río	—	Between Amazonas and Vaupés and between Caquetá and Vaupés
Apulo	4°32′N., 74°38′W.	Cundinamarca
Aquiles, Río (tributary of Río Mecaya)	—	Putumayo
Aracataca	10°35′N., 74°13′W.	Magdalena
Araracuara	0°35′S., 72°15′W.	Amazonas
Aratoka	6°42′N., 73°01′W.	Santander
Arauca, Río	—	Between Arauca and Venezuela
Arcabuco	5°44′N., 73°28′W.	Boyacá
Ariari, Río (affluent of Río Guaviare)	—	Meta
Arracachal (below Tequendama, Salto de, which see)	—	Cundinamarca
Arrayan	4°40′N., 74°05′W.	Cundinamarca

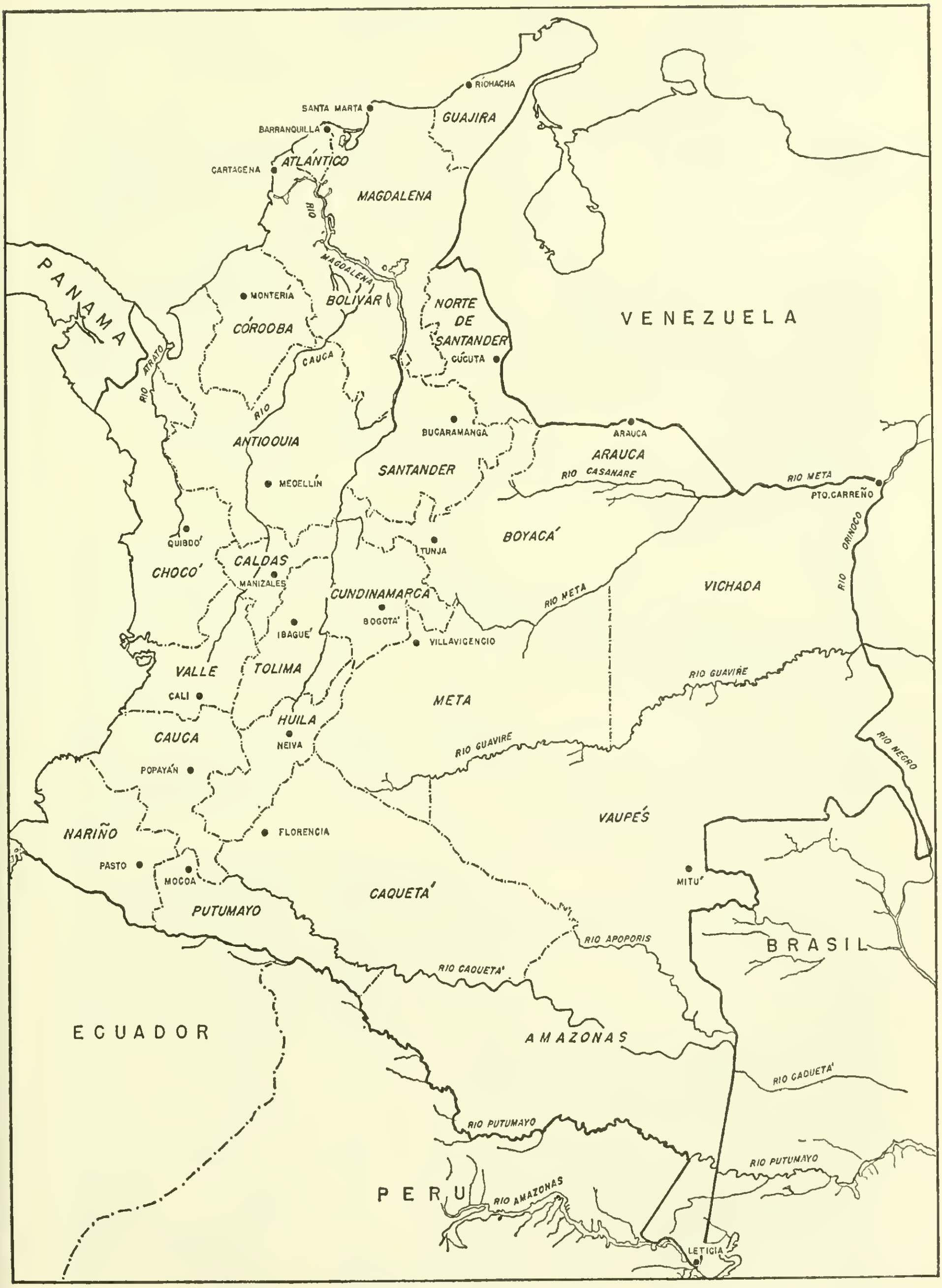
RIOHACHA
SANTA MARTA
GUAJIRA
BARRANQUILLA
CARTAGENA
ATLANTICO
MAGDALENA
RIO MAGDALENA
PANAMA
MONTERIA
BOLIVAR
NORTE DE SANTANDER
CORDOBA
VENEZUELA
CUCUTA
RIO CAUCA
RIO ATRATO
BUCARAMANGA
ARAUCA
ARAUCA
ANTIOQUIA
RIO CASANARE
SANTANDER
RIO META
MEDELLIN
PTO. CARREÑO
RIO ORINOCO
QUIBDO
TUNJA
BOYACA
CALDAS
CHOCO
MANIZALES
VICHADA
CUNDINAMARCA
RIO META
BOGOTA
IBAGUE
VILLAVICENCIO
VALLE
TOLIMA
RIO GUAVIRE
CALI
META
HUILA
CAUCA
NEIVA
RIO GUAVIRE
RIO NEGRO
POPAYAN
VAUPES
NARIÑO
FLORENCIA
PASTO
MOCOA
MITU
CAQUETA
PUTUMAYO
RIO APOPORIS
BRASIL
RIO CAQUETA
ECUADOR
AMAZONAS
RIO CAQUETA
RIO PUTUMAYO
RIO PUTUMAYO
PERU
RIO AMAZONAS
LETICIA

Figure 55.—The principal political subdivisions of Colombia, with their capitals and principal river systems.

Locality	*Latitude and Longitude*	*Territorial Unit*
Arroyo de Arenas (cattle ranch, 35 km. south of Ríohacha, which see)	—	Guajira
Aserrío (on Río Pescado)	1°15′N., 75°40′W.	Caquetá
Astillero	8°08′N., 72°35′W.	Norte de Santander
Atrato, Río	—	Chocó and between Chocó and Antioquia
Badillo	10°40′N., 73°16′W.	Magdalena
Balcones, Río (tributary of Río Bogotá)	—	Cundinamarca
Barbacoas, Río (=Río Camarones, enters Caribbean near Camarones)	—	Guajira
Barrancabermeja	7°03′N., 73°54′W.	Santander
Barranquilla	10°58′N., 74°47′W.	Atlántico
Baudó, Río (enters Pacific near 4°57′N.)	—	Chocó
Baudó, Serranía de	6°00′N., 77°00′W.	Chocó
Bellavista	6°31′N., 75°19′W.	Antioquia
Belmira	6°40′N., 75°40′W.	Antioquia
Beltrán	4°47′N., 74°47′W.	Cundinamarca
Betancí, Río or Caño (tributary of Río Sinú, which it enters near 8°38′N.)	—	Córdoba
Betania	4°12′N., 74°09′W.	Cundinamarca
Bitaco	3°37′N., 76°36′W.	Valle
Bogotá	4°40′N., 74°05′W.	Cundinamarca
Bogotá, Río (tributary of Río Magdalena, which it joins at Girardot)	—	Cundinamarca
Bonda	11°17′N., 74°08′W.	Magdalena
Boquerón Gorge (Bogotá)	4°40′N., 74°05′W.	Cundinamarca
Bucaramanga	7°10′N., 73°09′W.	Santander
Buenaventura	3°55′N., 77°05′W.	Valle
Buena Vista	8°03′N., 74°28′W.	Bolívar
Buenavista	2°49′N., 74°43′W.	Meta
Buenavista	1°30′N., 78°08′W.	Nariño
Buritaca, Río (enters Caribbean near 73°47′W.)	—	Magdalena
Cacique, Lagos de (4.7 km. southeast of Bucaramanga, which see)	—	Santander
Cafre, Río (tributary of Río Guaviare, which it joins just west of Río Ariari)	—	Meta
Caicedo	6°25′N., 75°59′W.	Antioquia
Caldas	6°06′N., 75°40′W.	Antioquia
Caldas	5°34′N., 73°54′W.	Boyacá
Cali	3°27′N., 76°31′W.	Valle

Locality	*Latitude and Longitude*	*Territorial Unit*
Calima, Río (tributary of Río San Juan, which it joins at Valle-Chocó border)	—	Valle
Camarones	11°25′N., 73°05′W.	Guajira
Camarones, Río (=Río Barbacoas)	—	Guajira
Cambao	4°54′N., 74°45′W.	Cundinamarca
Cananarí, Río (tributary of Río Apaporis, which it joins above Raudal Jirijirimo)	—	Vaupés
Candelaria	10°27′N., 74°54′W.	Atlántico
Candelaria	3°25′N., 76°22′W.	Valle
Caparappí	5°22′N., 74°29′W.	Cundinamarca
Caquetá, Río	—	Amazonas, between Caquetá and Amazonas, between Caquetá and Putumayo
Carare, Río (tributary of Río Magdalena, which it joins near 6°46′N.)	—	Santander
Cartagena	10°26′N., 75°32′W.	Bolívar
Casabe	7°03′N., 73°55′W.	Antioquia
Casa Blanca (near Ciénaga, which see)	—	Magdalena
Casanare, Río (tributary of Río Meta)	—	Between Arauca and Boyacá
Catatumbo, Río (enters Lago de Maracaibo in Venezuela)	—	Norte de Santander
Catival	8°17′N., 75°41′W.	Córdoba
Cauca, Río (tributary of Río Magdalena, which it joins at 8°55′N.)	—	Cauca, Valle, Caldas, Antioquia, and Bolívar
Ceilán (west of Florencia)	1°40′N., 75°43′W.	Caquetá
César, Río (tributary of Río Magdalena, which it enters at El Banco), also Río Cesare	—	Magdalena, Guajira
Chamega	—	Cundinamarca
Chía	4°52′N., 74°04′W.	Cundinamarca
Chicoral	4°13′N., 74°59′W.	Tolima
Chigorodó	7°41′N., 76°42′W.	Antioquia
Chingasa, Laguna	4°30′N., 73°45′W.	Cundinamarca
Chingasa, Páramo	4°35′N., 73°46′W.	Cundinamarca
Chipaque	4°27′N., 74°03′W.	Cundinamarca
Chisacá, Laguna de	4°17′N., 74°13′W.	Cundinamarca
Chisacá, Páramo de	4°17′N., 74°13′W.	Cundinamarca
Chita	6°12′N., 72°28′W.	Boyacá
Choachí	4°33′N., 73°57′W.	Cunarcadinam
Choachí, Páramo	4°33′N., 73°58′W.	Cundinamarca
Chorrera de la Elsa	—	?

Locality	*Latitude and Longitude*	*Territorial Unit*
Ciénaga	11°01′N., 74°15′W.	Magdalena
Cincinnati (coffee plantation 23 km. southeast of Santa Marta, which see)	—	Magdalena
Cimitarra	6°19′N., 73°57′W.	Santander
Cisneros	6°33′N., 75°05′W.	Antioquia
Cisneros	3°48′N., 76°45′W.	Valle
Coello, Río (tributary of Río Magdalena, which it joins near 4°17′N.)	—	Tolima
Colorados, Laguna de los (between Pasca and Usme)	—	Cundinamarca
Combeima, Río (rises in Nevado del Tolima, flows into Río Coello)	—	Tolima
Condoto	5°07′N., 76°40′W.	Chocó
Condoto, Río (tributary of upper Río San Juan, which it joins opposite Andagoya)	—	Chocó
Córdoba	0°51′N., 77°35′W.	Nariño
Córdoba	3°55′N., 76°57′W.	Valle
Corozal	6°13′N., 71°43′W.	Boyacá
Cota	4°48′N., 74°06′W.	Cundinamarca
Cruz Verde, Páramo	4°37′N., 74°04′W.	Cundinamarca
Cubigú, Caño (tributary of Río Vaupés, which it joins above Mitú)	—	Vaupés
Cucuana, Mesa de (near Guamo, which see)	—	Tolima
Cucuana, Río (tributary of Río Saldana, which it joins near 3°55′N.)	—	Tolima
Cúcuta	7°54′N., 72°31′W.	Norte de Santander
Cuduyarí, Río (tributary of Río Vaupés near Mitú)	—	Vaupés
Cumbal	0°54′N., 77°48′W.	Nariño
Cupica	6°43′N., 77°32′W.	Chocó
Cuquiari, Río (tributary of Río Vaupés, which it joins opposite Mitú)	—	Vaupés
Currulao, Río (enters Golfo de Urabá)	—	Antioquia
Curumani	9°12′N., 73°34′W.	Magdalena
Dagua, Río (enters Bahía de Buenaventura)	—	Valle
Dante, Quebrada de la	—	Magdalena
Darién, Serranía del (Mountain range between Panamá and northeastern Chocó)	—	Chocó
Don Diego	11°15′N., 73°42′W.	Magdalena

Locality	*Latitude and Longitude*	*Territorial Unit*
Dubazá, Río (tributary of Río Baudó)	—	Chocó
El Banco	9°00′N., 73°58′W.	Magdalena
El Boquerón (see Boquerón Gorge)	—	Cundinamarca
El Centro	—	Meta
El Centro	6°56′N., 73°45′W.	Santander
El Clara Creek (6 miles from Angelópolis, which see)	—	Antioquia
El Cucharo (hacienda near Tocaima, which see)	—	Cundinamarca
El Dintel (old railroad station about 20 km. northwest of Bogotá)	4°54′N., 74°20′W.	Cundinamarca
El Encano	1°09′N., 77°08′W.	Nariño
"El Mico" (ranch near Río Güejar, on Sabana de San Juan de Arama, which see)	—	Meta
El Pailon (12 km. from Buenaventura, which see)	—	Valle
El Real	7°38′N., 74°47′W.	Antioquia
El Refugio (camp on Río Guayabero, near mouth of Caño Morrocoy)	—	Meta
El Tambo	2°24′N., 76°50′W.	Cauca
El Tigre (on old trail between Cali and Buenaventura, 1,500–1,750 m.)	—	Valle
El Valle	6°07′N., 77°28′W.	Chocó
Encano (=El Encano, which see)	—	Nariño
"Entrado" (field camp in Serranía de La Macarena)	3°08′N., 73°52′W.	Meta
Envigado	6°11′N., 75°35′W.	Antioquia
Espinal	4°09′N., 74°53′W.	Tolima
Florencia	1°38′N., 75°36′W.	Caquetá
Florencia	1°40′N., 77°04′W.	Cauca
Fomeque	4°29′N., 73°56′W.	Cundinamarca
Forzosa (near Villavicencio, which see)	—	Meta
Frontino, Páramo	6°32′N., 76°05′W.	Antioquia
Fuerte, Isla	9°23′N., 76°12′W.	Bolívar (off Córdoba coast)
Fundación	10°31′N., 74°11′W.	Magdalena
Fusagasugá	4°22′N., 74°23′W.	Cundinamarca
Gachalá	4°41′N., 73°32′W.	Cundinamarca
Gaira	11°12′N., 74°13′W.	Magdalena
Galeras, Volcán	1°13′N., 77°22′W.	Nariño
Gambote	10°10′N., 75°17′W.	Bolívar
Garagoa	5°05′N., 73°21′W.	Boyacá
Gino-Gojé (rubber collectors' camp on Río Apaporis)	0°15′S., 70°28′W.	Vaupés

Locality	*Latitude and Longitude*	*Territorial Unit*
Girardot	4°18′N., 74°50′W.	Cundinamarca
Girón	7°04′N., 73°10′W.	Santander
Gorgona, Isla de	2°59′N., 78°12′W.	Off Cauca
Granada	3°33′N., 73°45′W.	Meta
Guaca	6°52′N., 72°52′W.	Santander
Guaca (=Heliconia, which see)	—	Antioquia
Guacayá, Caño (tributary of Río Apaporis, upstream from Río Piraparaná)	—	Amazonas
Guacayá, Río (tributary of Río Miritiparaná, which it joins at 0°37′S., 70°31′W.)	—	Amazonas
Guachacal	0°57′N., 77°43′W.	Nariño
Guaicaramo	4°38′N., 73°00′W.	Boyacá
Guaimaral, Río (tributary of Río César, which it enters near 9°50′N., 73°40′W.)	—	Magdalena
Guáitara, Río (tributary of Río Patía, which it joins at 1°35′N., 77°28′W.)	—	Nariño
Guaitarilla	1°10′N., 77°32′W.	Nariño
Gualanday	4°18′N., 75°03′W.	Tolima
Guali, Río (tributary of Río Magdalena, which it enters near Honda)	—	Tolima
Guamo	4°01′N., 74°59′W.	Tolima
Guamués, Río (tributary of upper Río Putumayo, which it joins west of Puerto Asís)	—	Nariño and Putumayo
Guandalay(?)	—	Tolima
Guapantal	4°52′N., 73°52′W.	Cundinamarca
Guapaya, Caño or Río (Serranía de La Macarena)	—	Meta
Guapáyita, Caño (Serranía de La Macarena)	—	Meta
Guaracapari, Raudal (falls on Río Vaupés)	1°03′N., 69°56′W.	Vaupés
Guasca	4°52′N., 73°52′W.	Cundinamarca
Guatapurí, Río (tributary of Río Cesare, rising on southeastern slopes of Sierra Nevada de Santa Marta)	—	Magdalena
Guatiquía, Río (affluent of Río Meta, Villavicencio is on bank)	—	Meta
Guaviare, Río	—	Between Meta and Vaupés, between Vichada and Vaupés
Guayabero, Río (affluent of Río Guaviare)	—	Meta and between Meta and Vaupés

Locality	*Latitude and Longitude*	*Territorial Unit*
Guayabito, Río (tributary of Río Carare, which it joins near 6°35′N.)	—	Santander
Güejar, Río (affluent of Río Ariari)	—	Meta
Guerаré, Río (tributary of middle Río Vaupés near Río Cuduyarí)	—	Vaupés
Güisito, near El Tambo (see Huisito)	—	Cauca
Guitarra, Laguna de la (on Páramo de Sumapaz, which see)	—	Cundinamarca
Gurlandy(?), west of Girardot	—	Cundinamarca
Gutiérrez	4°15′N., 74°01′W.	Cundinamarca
Hata, Páramo del (part of Páramo de Chisacá, which see)	—	Cundinamarca
Heliconia	6°13′N., 75°46′W.	Antioquia
Hermosa, Caño de La (see La Hermosa, Caño de)	—	Boyacá
Herrara, Cerro de La (see La Herrara, Cerro de)	—	Valle
Honda	5°12′N., 74°44′W.	Tolima
Honda, Quebrada (tributary of upper Río Güejar)	—	Meta
Honda, Río (tributary of Río Cauca, which it joins near 5°17′N.)	—	Caldas
Hueva Santa, Quebrada (Sierra Nevada de Santa Marta)	—	Magdalena
Huisito	2°25′N., 77°05′W.	Cauca
Ibagué	4°27′N., 75°13′W.	Tolima
Imbilí (small village on Río Mira)	—	Nariño
Inírida, Río (tributary of Río Guaviare, which it joins near 3°55′N., 67°52′W.)	—	Vaupés
Istmina	5°09′N., 76°43′W.	Chocó
Jericó	5°48′N., 75°47′W.	Antioquia
Jericó	6°10′N., 72°35′W.	Boyacá
Jiménez (Río Dagua valley, near Cisneros, which see)	—	Valle
Jino Gojé (see Gino-Gojé)	—	—
Jirijirimo, Raudal (falls on Río Apaporis)	0°08′N., 70°40′W.	Amazonas-Vaupés
Juan Minas	10°57′N., 74°50′W.	Atlántico
Juan Viñas (Juan Minas?)	—	Atlántico(?)
Junquilla (on Caño Betancí)	8°25′N., 75°50′W.	Córdoba
Juntas de Tamana	4°59′N., 76°24′W.	Chocó
Juradó	7°06′N., 77°46′W.	Chocó
La Ceja	6°03′N., 75°25′W.	Antioquia
La Ciudad de Madrigar	1°46′N., 77°30′W.	Nariño

Locality	*Latitude and Longitude*	*Territorial Unit*
La Concepción	3°14′N., 77°04′W.	Valle
La Cristalína, Caño Losada, which it joints near 2°12′N., 73°55′W.)	—	Meta
La Cumbre, Sierra Nevada de Santa Marta	—	Magdalena
La Girona, east of Lebríja (see Girón)	—	Santander
La Guayacana	1°18′N., 78°12′W.	Nariño
Laguneta (near Salento, which see)	—	Caldas
La Hermosa, Caño de (tributary of Río Meta, which it joins near 5°33′ N., 70°28′W.)	—	Boyacá
La Herrara, Cerro de (near Cali, which see)	—	Valle
La Lechera, Quebrada (tributary of Río Opón, near Vélez)	—	Santander
"La Macarena" (camp on upper Río Güejar)	—	Meta
La Macarena, Serranía de (isolated mountain range)	2°50′N., 73°55′W.	Meta
La Mesa	4°38′N., 74°28′W.	Cundinamarca
Landázuri	6°14′N., 73°50′W.	Santander
La Plata	2°23′N., 75°53′W.	Huila
La Playa, Raudal (falls on lower Río Apaporis, mouth of Río Piraparaná)	—	Amazonas-Vaupés
La Providencia (on Río Orteguaza)	1°10′N., 75°23′W.	Caquetá
La Raya	8°20′N., 74°34′W.	Bolívar
La Raya	0°46′N., 76°32′W.	Putumayo
La Raya, Laguna or Ciénaga de	8°20′N., 74°30′W.	Bolívar
Larilla (between Mamatoco and La Tigrera)	—	Magdalena
La Rusia, Páramo de	5°55′N., 73°10′W.	Santander-Boyacá border
La Salina	6°06′N., 72°20′W.	Boyacá
Las Animas Creek (tributary of Río Quito, which it enters at 5°21′N., 76°45′W.)	—	Chocó
Las Cruces (between San Felix and Marulanda)	5°20′N., 75°20′W.	Caldas
Las Cruces	1°34′N., 78°08′W.	Nariño
Las Cruces de Lopez(?)	—	—
La Selva	7°43′N., 72°38′W.	Norte de Santander
La Selva, Estación (railroad station)	4°45′N., 75°47′W.	Caldas
"Las Mesetas" (rain-forest between Cordillera Oriental and Serranía de La Macarena)	—	Meta

Locality	*Latitude and Longitude*	*Territorial Unit*
Las Papas, Páramo de	1°55′N., 76°37′W.	Cauca
"Las Ranas" (field camp on Pico Renjifo)	—	Meta
La Tagua	0°03′S., 74°40′W.	Putumayo
La Tigrera	11°12′N., 74°07′W.	Magdalena
La Unión	4°32′N., 73°56′W.	Cundinamarca
La Victoria (near Pepé, which see)	—	Chocó
La Victoria	4°32′N., 76°01′W.	Valle
Lebrija	7°07′N., 73°13′W.	Santander
Leiva	5°38′N., 73°33′W.	Boyacá
Leticia	4°09′S., 69°57′W.	Amazonas
Llanogrande	7°03′N., 76°16′W.	Antioquia
Loreto Yacú, Río (tributary of Río Amazonas, which it joins at 3°45′S., 70°22′W.)	—	Amazonas
Losada, Caño, Sabana, or Río (tributary of Río Guayabero, which it joins at 2°12′N., 73° 56′W.)	—	Meta
Los Mangos (=Cisneros, which see)	—	Valle
Los Micos	3°14′N., 73°58′W.	Meta
Los Pendales (forested region in southern Atlántico)	—	Atlántico
Macanal	4°58′N., 73°16′W.	Boyacá
Macarena, Serranía de La (see La Macarena, Serranía de)	—	Meta
Macuira, Serranía de (eastern end of peninsula)	—	Guajira
Madrid	4°44′N., 74°17′W.	Cundinamarca
Magdalena, Río	—	West: Atlántico, Bolívar, Antioquia, Caldas. Central: Tolima, Huila. East: Magdalena, Norte de Santander, Santander, Cundinamarca
Mamancanaca Valley (southern side of Sierra Nevada de Santa Marta)	—	Magdalena
Mamatoco	11°15′N., 74°09′W.	Magdalena
Manaure, near Pájaro	11°45′N., 72°32′W.	Guajira
Manis, south of Salamina	—	Caldas
Manizales	5°05′N., 74°32′W.	Caldas
Manso, Río (tributary of Río Sinú, which it joins at 7°40′N., 76°10′W.	—	Córdoba
Manzanares	5°16′N., 75°09′W.	Caldas

Locality	*Latitude and Longitude*	*Territorial Unit*
Manzanares, Río (enters Caribbean at Santa Marta)	—	Magdalena
Mariquita	5°12′N., 74°55′W.	Tolima
Marulanda	5°18′N., 75°17′W.	Caldas
Mataje, Río	—	Between Nariño and Ecuador
Mecaya, Río (tributary of upper Río Caquetá, which it enters at 0°28′N., 75°10′W.)	—	Putumayo
Mechengue	2°41′N., 77°14′W.	Cauca
Mechengue, Río (tributary of Río San Juan de Micay, which it joins at 2°40′ N., 77°13′W.)	—	Cauca
Medellín	6°15′N., 75°35′W.	Antioquia
Medina	4°30′N., 73°22′W.	Cundinamarca
Medialuna	10°35′N., 74°29′W.	Magdalena
Melgar	4°12′N., 74°38′W.	Cundinamarca
Menegua	4°06′N., 72°54′W.	Meta
Mesopotamia	5°54′N., 75°17′W.	Antioquia
Meta, Río (north)	—	Boyacá, Arauca
Meta, Río (south)	—	Vichada, Meta,
Mina Anchicayá, Laguna (near Cali, which see)	—	Valle
Minca	11°12′N., 74°04′W.	Magdalena
Minca, Río (San Lorenzo, Sierra Nevada de Santa Marta)	—	Magdalena
Mira, Río	—	Nariño and between Nariño and Ecuador
Miraflores	5°12′N., 73°12′W.	Boyacá
Miramonte (finca on Río Catatumbo)	—	Norte de Santander
Miritiparaná, Río (tributary of Río Caquetá, which it joins near 1°10′S., 70°05′W.)	—	Amazonas
Mitú	1°07′N., 70°03′W.	Vaupés
Mocoa	1°08′N., 76°38′W.	Putumayo
Mocoa, Río (tributary of Río Caquetá, which it enters at 1°04′N., 76°32′W.)	—	Putumayo
Mogotes	6°29′N., 72°58′W.	Santander
Monserrate(?)	—	Chocó
Monserrate-Arrayan (road above Bogotá)	—	Cundinamarca
Montañita (between Salamina and San Felix)	5°25′N., 75°25′W.	Caldas
Monte del Diablo, near La Ceja	—	Antioquia
Monte Líbano	8°21′N., 75°15′W.	Córdoba
Monte Redondo (Km. 73 on Bogotá-Villavicencio road)	4°20′N., 73°23′W.	Cundinamarca

Locality	*Latitude and Longitude*	*Territorial Unit*
Monterredondo (=Monte Redondo, which see)	—	Cundinamarca
Morelia	1°31′N., 75°52′W.	Caquetá
Morrocoy, Caño del (tributary of Río Guayabero, which it enters east of Río Losada)	—	Meta
Morrosquilla, Golfo de	9°30′N., 75°40′W.	Córdoba and Bolívar
Moscopán (region east of Popayán)	—	Cauca-Huila boundary
Munchique	2°28′N., 76°56′W.	Cauca
Murucucú, Cerro	8°00′N., 76°00′W.	Córdoba
Mutis (see Puerto Mutis)	—	Chocó
Muzo	5°33′N., 74°06′W.	Boyacá
Nazaret (=Betania, which see)	—	Cundinamarca
Nazaret	12°10′N., 71°18′W.	Guajira
Nechí	8°05′N., 74°47′W.	Antioquia
Nechí, Río (tributary of Río Cauca, which it joins at Nechí)	—	Antioquia
Negro, Caño (affluent of Caño Cubigú)	—	Vaupés
Negro, Río (tributary of Río Sucio, in vicinity of Llanogrande)	—	Antioquia
Neivá	2°56′N., 75°18′W.	Huila
Nilo	4°20′N., 74°39′W.	Cundinamarca
Noanama	4°39′N., 76°32′W.	Chocó
Novita	4°57′N., 76°38′W.	Chocó
Ocoa, Río (tributary of Río Guatiquía, southeast of Villavicencio)	—	Meta
Old Providence Island (see Providencia, Isla de)	—	San Andrés y Providencia
Opogodó	5°04′N., 76°40′W.	Chocó
Opogodó, Río (tributary of Río Atrato, which it joins near 6°50′N.; however, specimens listed in this report as from Río Opogodó are from stream in vicinity of town of Opogodó in the San Juan drainage)	—	Chocó
Opón, Río (tributary of Río Magdalena, which it enters south of Barrancabermeja)	—	Santander
Orinoco, Río	—	Between Vichada and Venezuela
Ortega, Río (tributary of Río Saldana, which it joins at 3°52′N., 75°07′W.)	—	Tolima
Orteguaza, Río (tributary of Río Caquetá, which it enters at Tres Esquinas)	—	Caquetá

Locality	*Latitude and Longitude*	*Territorial Unit*
Pacicuara	—	Meta
Pácora	5°32′N., 75°28′W.	Caldas
Pajarito	5°17′N., 72°43′W.	Boyacá
Pájaro	11°43′N., 72°40′W	Guajira
Palacio, Páramo de (just east of Bogotá)	—	Cundinamarca
Palestina	5°02′N., 75°39′W.	Caldas
Palestina	4°11′N., 77°09′W.	Chocó
Palestina	1°48′N., 76°03′W.	Huila
Palmar de Varela	10°44′N., 74°46′W.	Atlántico
Palomino	11°16′N., 73°34′W.	Magdalena
Pamplona	7°23′N., 72°38′W.	Norte de Santander
Papas, Páramo de Las (see Las Papas, Páramo de)	—	Cauca
Papayal, Brazo or Caño (channel of Río Magdalena, joining main stream west of El Banco)	—	Bolívar
Paramillo, Nudo de (mountains near northern end of Cordillera Oriental)	7°00′N., 76°00′W.	Antioquia
Pasca	4°19′N., 74°18′W.	Cundinamarca
Pasto	1°13′N., 77°17′W.	Nariño
Patía, Río (enters Pacific near 2°10′N.)	—	Cauca and Nariño
Pechelín, Río (enters Golfo de Morrosquillo at Tolú)	—	Bolívar
Peligro (on road between Ramiriquí and Rondón)	—	Boyacá
Peña Lisa (village, 3–4 miles from Condoto, which see)	—	Chocó
Pendales, Los (see Los Pendales)	—	Atlántico
Pensilvania	5°32′N., 75°06′W.	Caldas
Pepé	5°07′N., 76°52′W.	Chocó
Pepé, Río (tributary of lower Río Baudó, which it enters near 5°03′N., 77°04′W.)	—	Chocó
Peperital (near Villavicencio, which see)	—	Meta
Pereira	4°48′N., 75°42′W.	Caldas
Pescado, Río (tributary of Río Orteguaza, which it enters at 1°12′N., 75°21′W.)	—	Caquetá
Pinturas, Cerro de las, upper Río Inírida	—	Vaupés
Piraboton, Río (right tributary of upper Río Guerará)	—	Vaupés
Piraparaná, Río (tributary of Río Apaporis, which it joins near 1°30′N., 70°16′W.)	—	Vaupés
Pitalito	1°51′N., 76°02′W.	Huila
Pizarro	4°58′N., 77°22′W.	Chocó

Locality	*Latitude and Longitude*	*Territorial Unit*
Playa de Oro	5°19′N., 76°23′W.	Chocó
Ponedera	10°38′N., 74°44′W.	Atlántico
Popayán	2°26′N., 76°36′W.	Cauca
Popoyacá, Río (tributary of Río Apaporis, "upstream from Piraparaná")	—	Vaupés
Porce, Río (tributary of Río Nechí, which it joins at 7°25′N., 74°56′W.)	—	Antioquia
Porcecito	6°33′N., 75°13′W.	Antioquia
Providencia, Isla de	13°21′N., 81°22′W.	San Andrés y Providencia
Pueblo Chico	—	Caldas
Pueblo Nuevo, near Nilo	—	Cundinamarca
Pueblorrico	5°37′N., 75°52′W.	Antioquia
Pueblorrico (or Pueblo Rico)	5°13′N., 76°09′W.	Caldas
Puerto Asís	0°31′N., 76°31′W.	Putumayo
Puerto Berrio	6°32′N., 74°25′W.	Antioquia
Puerto Boyacá	5°47′N., 74°40′W.	Boyacá
Puerto Liévano	5°31′N., 74°38′W.	Caldas
Puerto López	11°54′N., 71′17′W.	Guajira
Puerto López	4°05′N., 72°58′W.	Meta
Puerto Mutis	6°14′N., 77°27′W.	Chocó
Puerto Nariño	3°45′S., 70°22′W.	Amazonas
Puerto Salgar	5°27′N., 74°41′W.	Cundinamarca
Puerto Utria	6°02′N., 77°24′W.	Chocó
Puerto Wilches	7°22′N., 73°55′W.	Santander
Puerto Yaviya (upper Río Apaporis, "2½ days . . . upstream from Soratama," by motorboat)	—	Vaupés(?)
Puracé	2°23′N., 76°28′W.	Cauca
Purí	7°25′N., 75°20′W.	Antioquia
Putumayo, Río	—	Between Nariño, Putumayo, and Amazonas and Peru and Ecuador
Quesado, Río (tributary of Río Atrato)	—	Chocó
Quetame	4°22′N., 73°54′W.	Cundinamarca
Quía, Cerros de (mountains between Panamá and Chocó)	—	Chocó
Quibdó	5°42′N., 76°40′W.	Chocó
Quimarí, Alto de	8°07′N., 76°23′W.	Córdoba
Quindío, Mountains (Cordillera Central in southeastern Caldas and west-central Tolima)	—	Caldas and Tolima
Quintana	2°23′N., 76°21′W.	Cauca
Quito, Río (tributary of Río Atrato, which it joins at Quibdó)	—	Chocó
Ramiriquí	5°27′N., 73°20′W.	Boyacá

Locality	*Latitude and Longitude*	*Territorial Unit*
Raposo	3°40′N., 77°03′W.	Valle
Raposo, Río (enters Pacific near Raposo)	—	Valle
Raspadura, Boca de la (upper Río Quito)	5°22′N., 76°45′W.	Chocó
Raya, Ciénaga de la (see La Raya, Laguna or Ciénaga de)	—	Bolívar
Regeneración	8°07′N., 74°29′W.	Bolívar
Renjifo, Río (Serranía de La Macarena)	—	Meta
Renjifo, Pico (highest peak in Serranía de La Macarena, 6 km. southwest of Entrado, which see)	—	Meta
Ricaurte	1°12′N., 77°59′W.	Nariño
Río Frío	10°55′N., 74°10′W.	Magdalena
Ríofrío	4°09′N., 76°18′W.	Valle
Río Frío Mountains	—	—
Ríohacha	11°33′N., 74°55′W.	Guajira
Ríonegro	6°11′N., 75°24′W.	Antioquia
Ríonegro (or Río Negro)	7°17′N., 73°10′W.	Santander
Ríosucio	5°26′N., 75°44′W.	Caldas
Ríosucio	7°28′N., 77°08′W.	Chocó
Ríosucio	7°39′N., 75°54′W.	Córdoba
Río Tarra	8°35′N., 73°06′W.	Norte de Santander
Río Viejo	8°35′N., 73°50′W.	Bolívar
Rondón	5°22′N., 73°13′W.	Boyacá
Rosario, Río (enters Rada de Tumoco near 1°46′N., 78°38′W.)	—	Nariño
Ruiz, Nevada del	4°54′N., 75°18′W.	Caldas-Tolima border
Rumiyaco, Río (tributary of Río Mocoa, which it joins south of Mocoa)	—	Putumayo
Rumiyacu, Río (tributary of Río San Miguel, which it joins at 0°31′N., 77°10′W.)*	—	Nariño
Rusia, Páramo de La (see La Rusia, Páramo de)	—	Santander-Boyacá
Sabanilla (former seaport of Barranquilla, now under water)	11°05′N., 74°55′W.	Atlántico
Salamina	5°25′N., 75°30′W.	Caldas
Salamina	10°30′N., 74°49′W.	Magdalena
Salaza (northeast of El Banco, which see)	—	Magdalena

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*According to Dr. Carlos Lehmann and Dr. Féderico Medem, the drainage area of the Río San Miguel, including the Río Rumiyacu and the town of Santa Rosa de Sucumbíos, is now considered part of Ecuador. However, since that area appears on official maps of Colombia, we have included specimens from there in this report.

Locality	*Latitude and Longitude*	*Territorial Unit*
Saldana, Río (tributary of Río Magdalena, which it joins at 3°59′N., 74°53′W.)	—	Tolima
Salento	4°38′N., 75°35′W.	Caldas
Samana	5°33′N., 74°56′W.	Caldas
Sampedro (=San Pedro, which see)	—	Antioquia
San Adolfo	1°49′N., 75°51′W.	Huila
San Agustín	1°53′N., 76°16′W.	Huila
San Andrés	6°48′N., 72°52′W.	Santander
San Andrés, Isla de	12°36′N., 81°40′W.	San Andrés y Providencia
San Antonio	9°03′N., 74°47′W.	Bolívar
San Antonio	4°37′N., 74°22′W.	Cundinamarca
San Antonio	11°33′N., 72°53′W.	Guajira
San Antonio	2°56′N., 75°05′W.	Huila
San Antonio (about 25 km. west of San Agustín, which see)	—	Huila
San Antonio (former Indian village, Sierra Nevada de Santa Marta)	11°00′N., 73°26′W.	Magdalena
San Antonio	0°31′N., 76°46′W.	Putumayo
San Antonio	3°54′N., 75°30′W.	Tolima
San Antonio	3°20′N., 77°12′W.	Valle
San Calixto	8°25′N., 73°14′W.	Norte de Santander
Sando, Caño or Quebrada (tributary of Río Pepé)	—	Chocó
San Félix	5°24′N., 75°22′W.	Caldas
San Francisco	4°58′N., 74°18′W.	Cundinamarca
San Francisco	1°11′N., 76°56′W.	Putumayo
San Gil	6°33′N., 73°08′W.	Santander
San Isidro (8 km. south of Gachalá, which see)	—	Cundinamarca
San Isidro	3°30′N., 77°03′W.	Valle
San Javier (near La Mesa, which see)	—	Cundinamarca
San Joaquín, Río (tributary of Río Mechengue)	—	Cauca
San Jorge, Río (tributary of Río Magdalena, which it joins at 9°09′N., 74°45′W.)	—	Bolívar and Córdoba
San Juan, Río (enters Caribbean at 8°47′N.)	—	Antioquia
San Juan, Río	—	Caldas, Chocó, and between Chocó and Valle
San Juan, Río (see San Juan de Micay, Río)	—	Cauca
San Juan de Arama	3°26′N., 73°53′W.	Meta
San Juan de Mechengue (=Mechengue, which see)	—	Cauca

Locality	*Latitude and Longitude*	*Territorial Unit*
San Juan de Micay, Río (enters Pacific near 3°05′N.)	—	Cauca
San Lorenzo (mountain peak at northwestern end of Sierra Nevada de Santa Marta)	—	Magdalena
San Mateo	6°24′N., 72°32′W.	Boyacá
San Miguel	4°25′N., 74°19′W.	Cundinamarca
San Miguel	10°59′N., 73°51′W.	Magdalena
San Miguel	0°15′N., 76°35′W.	Putumayo
San Miguel	6°37′N., 72°37′W.	Santander
San Miguel, Río (tributary of Río Putumayo; see footnote under Rumiyacu, Río)	—	Between Putumayo and Ecuador and Nariño and Ecuador
San Pablo, Río (tributary of upper Río Quita, which it joins at Boca de la Raspadura, which see)	—	Chocó
San Pedro	6°28′N., 75°33′W.	Antioquia
San Pedro	9°14′N., 75°04′W.	Bolívar
San Pedro	4°00′N., 76°15′W.	Valle
Sanquianga, Río (enters Pacific near 2°30′N., 78°20′W.)	—	Nariño
Santa Ana, Quebrada (tributary of Río Opogodó, near town of Opogodó)	—	Chocó
Santa Bárbara	5°53′N., 75°35′W.	Antioquia
Santa Cecilia	5°18′N., 76°13′W.	Caldas
Santa Elena	3°39′N., 76°16′W.	Valle
Santa Inés (north of Medellín, which see)	—	Antioquia
Santa Librada (southwest of Pamplona, which see)	7°15′N., 72°20′W.	Norte de Santander
Santa Marta	11°15′N., 74°14′W.	Magdalena
Santa Marta, Sierra Nevada de	—	Magdalena and Guajira
Santander	3°01′N., 76°29′W.	Cauca
Santander	—	Cundinamarca
Santandercito (below Tequendama Falls)	4°38′N., 74°14′W.	Cundinamarca
Santa Rita Creek (14 miles north of Mespotamia, which see)	—	Antioquia
Santa Rosa (see Santa Rosa de Osos)	—	Antioquia
Santa Rosa de Sucumbíos (see footnote under Rumiyacu, Río)	0°22′N., 77°10′W.	Putumayo
Santa Rosa de Aso	—	Caldas
Santa Rosa de Cabal	4°52′N., 75°38′W.	Caldas
Santa Rosa de Osos	6°39′N., 75°28′W.	Antioquia
Santiago	1°10′N., 77°00′W.	Putumayo

Locality	*Latitude and Longitude*	*Territorial Unit*
Santuario	6°09′N., 75°15′W.	Antioquia
Santurbán, Páramo de	7°20′N., 73°05′W.	Santander
Sapuyes, Río (affluent of Río Guáitara)	—	Nariño
Sarare, Río (tributary of Río Apure in Brazil)	—	Norte de Santander
Sasaima	4°57′N., 74°26′W.	Cundinamarca
Satinga	2°25′N., 78°15′W.	Nariño
Satinga, Río (short river, joins Río Sanquianga near its mouth)	—	Nariño
Sautatá	7°52′N., 77°10′W.	Chocó
Sencella, Río (tributary of Río Caquetá, which it joins near 0°18′N., 75°00′W.)	—	Putumayo
Sibate	4°31′N., 74°17′W.	Cundinamarca
Siecha, Laguna de (on Páramo de Palacia, just east of Bogotá)	—	Cundinamarca
Simacota	6°27′N., 73°20′W.	Santander
Simitarra (= Cimitarra, which see)	—	Santander
Sincelejo	9°18′N., 75°24′W.	Bolívar
Sinú, Río (enters Caribbean near 9°25′N., 76°50′W.)	—	Antioquia and Córdoba
Sipí, Río (tributary of Río San Juan, which it enters at 4°45′N.)	—	Chocó
Socarré (on Río Sinú)	7°53′N., 76°22′W.	Córdoba
Sogamoso, Río (tributary of Río Magdalena, which it joins north of Barrancabermeja)	—	Santander
Solano, Bahía de	6°15′N., 77°25′W.	Chocó
Sonsón	5°43′N., 75°18′W.	Antioquia
Soratama (former rubber camp on Río Apaporis, "upstream from Río Cananari")	—	Amazonas
Suárez, Río (affluent of Río Sogamoso)	—	Boyacá and Santander
Suaza, Río (tributary of Río Magdalena, which it joins near 2°11′N., 75°42′W.)	—	Huila
Sucio, Río (tributary of Río Atrato, which it joins at 7°26′N.)	—	Antioquia and Chocó
Sucumbíos, Río (=Río San Miguel, which see)	—	—
Sumapaz, Páramo de	3°55′N., 74°20′W.	Cundinamarca
Surubaka, Páramo de (Sierra Nevada de Santa Marta)	—	Magdalena
Sutatausa	5°15′N., 73°53′W.	Cundinamarca
Sutatenza	5°03′N., 73°28′W.	Boyacá

Locality	*Latitude and Longitude*	*Territorial Unit*
Tabio	4°55′N., 74°06′W.	Cundinamarca
Tamá, Páramo de	7°26′N., 72°21′W.	Norte de Santander
Tamana, Río (tributary of Río San Juan, which it joins at 5°00′N.)	—	Chocó
Tambo (see El Tambo)	—	Cauca
Tarra, Río (tributary of Río Catatumbo, which it joins at 8°39′N., 73°01′W.)	—	Norte de Santander
Tequendama, Salto de (falls on Río Bogotá)	4°34′N., 74°18′W.	Cundinamarca
Tibú	8°40′N., 72°42′W.	Norte de Santander
Tierra Alba	—	Bolívar
Tierra Alta	8°11′N., 76°04′W.	Córdoba
Tierra Alta	9°07′N., 75°47′W.	Córdoba
Tigrera (= La Tigrera, which see)	—	Magdalena
Tiquié(?) Río	—	—
Tocaima	4°28′N., 74°40′W.	Cundinamarca
Tolima, Nevada del	4°40′N., 75°20′W.	Tolima
Tolú	9°33′N., 75°36′W.	Bolívar
Tolúviejo	9°28′N., 75°27′W.	Bolívar
Torquita, Cerro de (near Chía, which see)	—	Cundinamarca
Tota, Laguna de	5°32′N., 72°55′W.	Boyacá
Tres Esquinas	0°42′N., 75°14′W.	Caquetá
Truando, Río (tributary of Río Atrata, which it enters south of Ríosucio)	—	Chocó
Tuí, Caño (tributary of Río Vaupés, which it enters between Mitú and Raudal de Yupurari)	—	Vaupés
Tumaco	1°49′N., 78°43′W.	Nariño
Tunja	5°32′N., 73°22′W.	Boyacá
Túquerres	1°06′N., 77°37′W.	Nariño
Turbo	8°06′N., 76°45′W.	Antioquia
Uaracapari(?) (probably Guaracapari, Raudal, which see)	—	Vaupés
Umbría	0°51′N., 76°33′W.	Putumayo
Unguía	8°03′N., 77′08′W.	Chocó
Upía, Río (tributary of Río Meta, which it joins at 4°20′N., 72°47′W.)	—	Boyacá, and between Boyacá and Meta
Urabá, Golfo de	8°20′N., 76°50′W.	Chocó and Antioquia
Urabá (on Río Currulao)	8°02′N., 76°38′W.	Antioquia
Urcusique	1°01′N., 76°37′W.	Putumayo
Uré, Río (tributary of Río San Jorge, which it joins at 7°57′N., 75°31′W.)	—	Córdoba

Locality	*Latitude and Longitude*	*Territorial Unit*
Urrao	6°20′N., 76°11′W.	Antioquia
Usme	4°29′N., 74°08′W.	Cundinamarca
Uruguay (finca?)	—	Meta
Utría, Ensenada or Bahía	6°00′N., 77°25′W.	Chocó
Valdivia	7°11′N., 75°26′W.	Antioquia
Valdivia, Quebrada (9 km. south of Valdivia, which see)	—	Antioquia
Valledupar	10°28′N., 73°14′W.	Magdalena
Valupés, Río (tributary of Río Negro in Brazil)	—	Vaupés, and between Vaupés and Brazil
Vélez	6°02′N., 73°42′W.	Santander
Ventanas (northwest of Yarumal, which see)	—	Antioquia
Verjon, Páramo de (southeast of Bogotá)	—	Cundinamarca
Viernes Santo, Quebrada (San Lorenzo)	—	Magdalena
Vijogual, Páramo (20 km. north of Pajarito, which see)	—	Boyacá
Villa Arteaga (rubber plantation on road between Turbo and Medellín, near Turbo)	—	Antioquia
Villa María (or Villamaría)	5°03′N., 75°32′W.	Caldas
Villa María (on Río Orteguaza, southwest of Florencia, which see)	—	Caquetá
Villanueva	10°27′N., 75°16′W.	Bolívar
Villanueva	10°37′N., 72°58′W.	Guajira
Villavicencio	4°09′N., 73°38′W.	Meta
Villeta	5°01′N., 74°30′W.	Cundinamarca
Volcanes (ranch near Caparappí, which see)	—	Cundinamarca
Yapoboda, Cerro (Río Cuduyarí)	—	Vaupés
Yarumal	6°58′N., 75°24′W.	Antioquia
Yarumal	3°07′N., 76°37′W.	Valle
Yupurari, Raudal de (falls on Río Vaupés)	0°50′N., 70°45′W.	Vaupés
Yurupari, Raudal de (= Yupurarí, Raudal de)	—	Vaupés
Zetaquirá	5°16′N., 73°14′W.	Boyacá
Zuaraza (Pueblo Chico)	—	Caldas
Zulia, Río (tributary of Río Catatumbo in Venezuela)	—	Norte de Santander

Species Distribution

We are well aware of the truth in the adage that lists like those below indicate the distribution of collectors as much as they do the distribution of species. Because this is so, we feel justified in summarizing the distribution of Colombian frogs by political subdivisions, for the listings emphasize the areas where both extensive collecting and intensive collecting are needed.

Following is a list of the 25 principal political subdivisions in Colombia sequentially arranged according to the decreasing number of known species and subspecies of frogs.

Territorial unit	*Number of forms*	*Territorial unit*	*Number of forms*
Antioquia	61	Nariño	27
Meta	49	Norte de Santander	27
Amazonas	46	Bolívar	22
Chocó	45	Córdoba	19
Cundinamarca	42	Putumayo	19
Valle	36	Vaupés	18
Caldas	33	Huila	13
Cauca	33	Atlántico	10
Magdalena	33	Guajira	8
Santander	28	Vichada	2
Tolima	28	San Andrés y Providencia	1
Boyacá	27	Arauca	0
Caquetá	27		

We feel that in only a few areas has collecting been thorough enough to provide representatives of all species that actually occur in these political subdivisions. The single species known from San Andrés y Providencia probably is the only one that occurs there, but it would be ridiculous to assume that no frogs are to be found in Arauca and that only two species inhabit Vichada. It is certain that Colombia will remain a fertile field for avid collectors for many years to come.

Following is an alphabetically arranged listing of the principal subdivisions with the names of the species and subspecies known from each.

AMAZONAS
Pipa snethlageae
pipa
Dendrobates trivittatus
Phyllobates femoralis
palmatus
Rana palmipes
Otophryne robusta
Bufo typhonius
marinus
Atelopus varius bibroni
Hyla lanciformis
maxima
carbrerai
punctata
granosa
rubra

AMAZONAS—Continued
parviceps
riveroi
leucophyllata
sarayacuensis
rossalleni
membranacea
oliveae
laynei
hobbsi
Osteocephalus taurinus
leprieuri
Phyllomedusa bicolor
Phrynohyas venulosa
Sphaenorhynchus habrus
aurantiacus
dorisae

AMAZONAS—Continued
- Ceratophrys cornuta
- Edalorhina perezi
- Eleutherodactylus terraebolivaris
  - affinis
- Hydrolaetare schmidti
- Leptodactylus marmoratus
    - hylaedactylus
  - pentadactylus
  - rhodomystax
  - insularum
  - rubido
  - sibilatrix
  - intermedius
  - podicipinus petersi
- Lithodytes lineatus

ANTIOQUIA
- Dendrobates lugubris
  - opisthomelas
  - minutus minutus
  - tinctorius histrionicus
- Phyllobates bicolor
  - thorntoni
  - chocoensis
  - brunneus
  - palmatus
  - latinasus
- Rana palmipes
- Relictivomer pearsei
- Glossostoma aterrimum
- Bufo rostratus rostratus
  - rostratus nicefori
  - granulosus humboldti
  - typhonius
  - marinus
  - hypomelas
- Atelopus nicefori
  - varius bibroni
- Cerathyla johnsoni
- Cryptobatrachus fuhrmanni
- Gastrotheca bufona
  - nicefori
  - monticola argenteovirens
- Hyla crepitans
  - maxima
  - phantasmagoria
  - foliamorta
  - bogerti
  - leucophyllata
  - ebraccata
- Phyllomedusa nicefori
- Smilisca phaeota
  - gabbi

ANTIOQUIA—Continued
- Eleutherodactylus conspicillatus
  - anomalus
  - raniformis
  - longirostris
  - w-nigrum
  - surdus cabrerai
  - latidiscus latidiscus
  - cruentus
  - erythropleurus
  - vertebralis
  - frater
  - cornutus cornutus
- Eupemphix pustulosus
- Leptodactylus insularum
  - mystaceus
  - poecilochilus poecilochilus
  - poecilochilus diptychus
  - sibilatrix
  - podicipinus petersi
- Physalaemus neglectus dunni
- Centrolene geckoideum
- Centrolenella antioquiensis
  - parabambae
  - johnelsi
  - grandisonae

ARAUCA
- No species recorded

ATLÁNTICO
- Phyllobates palmatus
- Bufo granulosus humboldti
  - marinus
- Hyla crepitans
  - microcephala
- Ceratophrys calcarata
- Eupemphix pustulosus
- Leptodactylus insularum
- Pleurodema brachyops
  - sagittifer

BOLÍVAR
- Dendrobates lugubris
- Phyllobates palmatus
  - inguinalis
- Pseudis paradoxa nicefori
- Bufo glaberrimus
  - granulosus humboldti
  - typhonius
  - marinus
- Atelopus varius bibroni
- Hyla crepitans
  - phantasmagoria
  - rubra
  - microcephala

BOLÍVAR—Continued
- Phrynohyas venulosa
- Eleutherodactylus conspicillatus
  - anomalus
- Eupemphix pustulosus
- Leptodactylus insularum
  - poecilochilus diptychus
  - sibilatrix
  - podicipinus petersi
- Pleurodema brachyops

BOYACÁ
- Phyllobates brunneus
  - inguinalis
  - subpunctatus walesi
- Elachistocleis ovalis
- Glossostoma aterrimum
- Atelopus ebenoides marinkellei
- Cryptobatrachus nicefori
- Gastrotheca nicefori
- Hyla lanciformis
  - crepitans
  - maxima
  - geographica geographica
  - albomarginata
  - rubra
  - palpebrogranulata
  - labialis labialis
  - labialis platydactyla
- Smilisca gabbi
- Eleutherodactylus affinis
  - cruentus
  - vertebralis
- Leptodactylus marmoratus
  - haylaedactylus
  - insularum
  - rubido
  - podicipinus petersi
- Physalaemus neglectus dunni
- Centrolenella buckleyi

CALDAS
- Dendrobates lugubris
  - minutus ventrimaculatus
  - tinctorius histrionicus
- Phyllobates bicolor
  - femoralis
  - brunneus
  - latinasus
  - inguinalis
- Glossostoma aterrimum
- Atelopus spurrelli
  - varius bibroni
- Gastrotheca nicefori

CALDAS—Continued
- Hyla maxima
  - guibei
  - rubra
  - bogerti
- Smilisca phaeota
- Amblyphrynus ingeri
- Ceratophrys cornuta
- Eleutherodactylus bufoniformis
  - conspicillatus
  - anomalus
  - raniformis
  - longirostris
  - brederi
  - w-nigrum
  - palmeri
  - lehmanni
  - latidiscus latidiscus
  - cruentus
  - erythropleurus
  - vertebralis
- Centrolenella grandisonae

CAQUETÁ
- Dendrobates ingeri
  - minutus ventrimaculatus
- Phyllobates femoralis
  - brunneus
  - palmatus
- Rana palmipes
- Bufo ceratophrys
  - typhonius
- Hyla lanciformis
  - maxima
  - calcarata
  - rhodoporus
  - granosa
  - rubra
  - parviceps
  - marmorata
  - mathiassoni
  - leucophyllata
  - reticulata
- Phyllomedusa boliviana
- Phrynohyas venulosa
- Eleutherodactylus cruentus
- Leptodactylus marmoratus
    - hylaedactylus
  - pentadactylus
  - mystaceus
  - poecilochilus diptychus
- Centrolenella parabambae

CAUCA
- Dendrobates tinctorius confluens

CAUCA—Continued
- Phyllobates bicolor
  - boulengeri
  - mertensi
  - brunneus
  - latinasus
- Rana palmipes
- Bufo typhonius
- Atelopus bufoniformis
  - ignescens
  - pedimarmoratus
  - longibrachius
  - varius bibroni
  - varius elegans
- Gastrotheca cornutum
  - aureomaculata
  - mertensi
  - monticola argenteovirens
- Hyla columbiana
  - rubra
- Hyloscirtus bogotensis
- Eleutherodactylus longirostris
  - brederi
  - calcaratus
  - w-nigrum
  - affinis
  - latidiscus latidiscus
  - cruentus
  - erythropleurus
  - vertebralis
  - gularis
- Leptodactylus insularum
- Centrolenella buckleyi

CHOCÓ
- Dendrobates lugubris
  - tinctorius wittei
  - tinctorius histrionicus
  - tinctorius chocoensis
- Phyllobates bicolor
  - chocoensis
  - brunneus
  - pratti
  - latinasus
  - inguinalis
- Rana palmipes
- Relictivomer pearsei
- Bufo coniferus
  - haematiticus
  - typhonius
  - marinus
  - hypomelas
- Atelopus spurrelli
  - longibrachius

CHOCÓ—Continued
  - varius glyphus
- Agalychnis calcarifer
  - spurrelli
- Cerathyla proboscidea
- Gastrotheca aureomaculata
- Hyla maxima
  - rubracyla
  - rubra
  - boulengeri
  - phlebodes
  - microcephala
- Phyllomedusa edentula
- Smilisca phaeota
- Eleutherodactylus bufoniformis
  - conspicillatus
  - anomalus
  - raniformis
  - longirostris
  - brederi
  - calcaratus
  - taeniatus
  - cruentus
  - frater
  - diastema
- Leptodactylus pentadactylus
  - mystaceus

CÓRDOBA
- Elachistocleis ovalis
- Pseudis paradoxa nicefori
- Bufo granulosus humboldti
  - typhonius
- Atelopus ignescens
- Agalychnis spurrelli
- Hyla crepitans
  - rosenbergi
  - maxima
  - rubra
  - boulengeri
  - bokermanni
- Hyla ebraccata
- Phrynohyas venulosa
- Eupemphix pustulosus
- Leptodactylus marmoratus hylaedactylus
  - insularum
  - sibilatrix
  - poecilochilus diptychus

CUNDINAMARCA
- Dendrobates lugubris
- Phyllobates brunneus
  - palmatus
  - subpunctatus subpunctatus

CUNDINAMARCA—Contiuued
- vergeli
- Rana palmipes
- Bufo glaberrimus
  - granulosus humboldti
  - typhonius
  - marinus
  - sternosignatus
- Atelopus varius subornatus
  - varius bibroni
  - pedimarmoratus
- Gastrotheca nicefori
  - monticola argenteovirens
- Hyla crepitans
  - geographica geographica
  - rubra
  - boulengeri
  - palpebrogranulata
  - labialis labialis
  - labialis krausi
  - microcephala
  - leucophyllata
- Hyloscirtus bogotensis
- Phyllomedusa tarsius
- Amblyphrynus ingeri
- Eleutherodactylus raniformis
  - brederi
  - w-nigrum
  - bogotensis
  - elegans
  - affinis
  - cruentus
  - frater
  - megalops
- Eupemphix pustulosus
- Leptodactylus insularum
  - rubido
  - sibilatrix
  - podicipinus petersi

GUAJIRA
- Bufo granulosus humboldti
- Hyla crepitans
- Ceratophrys calcarata
- Eupemphix pustulosus
- Leptodactylus insularum
  - poecilochilus diptychus
- Pleurodema brachyops
- Pseudopaludicola pusilla

HUILA
- Atelopus ebenoides ebenoides
- Gastrotheca aureomaculata
- Hyla carri
  - rubra

HUILA—Continued
- Osteocephalus orcesi
- Eleutherodactylus conspicillatus
  - longirostris
  - calcaratus
  - w-nigrum
  - vertebralis
  - latidiscus tamsitti
- Leptodactylus pentadactylus
  - insularum

MAGDALENA
- Dendrobates lugubris
- Phyllobates brunneus
- Relictivomer pearsei
- Pseudis paradoxa nicefori
- Bufo granulosus beebei
  - granulosus humbolti
  - marinus
- Atelopus varius subornatus
  - carrikeri
  - walkeri
- Cryptobatrachus boulengeri
- Hyla crepitans
  - punctata
  - microcephala
- Ceratophrys calcarata
- Eleutherodactylus calcaratus
  - w-nigrum
  - delicatus
  - sanctae-martae
  - affinis
  - carmelitae
  - insignitus
  - cruentus
  - vertebralis
  - megalops
  - cornutus cornutus
- Eupemphix pustulosus
- Leptodactylus insularum
  - poecilochilus diptychus
  - sibilatrix
- Pleurodema brachyops
- Pseudopaludicola pusilla
- Geobatrachus walkeri

META
- Dendrobates hahneli
- Phyllobates femoralis
  - brunneus
  - palmatus
  - subpunctatus subpunctatus
- Rana palmipes
- Elachistocleis ovalis
- Ctenophryne geayi

META—Continued
- Bufo glaberrimus
  - granulosus humboldti
  - typhonius
  - marinus
- Gastrotheca medemi
- Hyla lanciformis
  - crepitans
  - maxima
  - calcarata
  - buckleyi
  - punctata
  - rubeola
  - rhodoporus
  - rubra
  - boulengeri
  - palpebrogranulata
  - labialus labialis
  - minuta
  - riveroi
  - mathiassoni
- Osteocephalus taurinus
  - leprieuri
- Phyllomedusa hypochondrialis hypochondrialis
  - nicefori
- Borborocoetes columbianus
- Phrynohyas venulosa
- Eleutherodactylus raniformis
  - lymani
  - calcaratus
  - terraebolivaris
  - w-nigrum
  - frater
- Leptodactylus marmoratus hylaedactylus
  - pentadactylus
  - mystaceus
  - sibilatrix
  - podicipinus petersi
- Lithodytes lineatus
- Physalaemus neglectus dunni
- Pseudopaludicola pusilla
- Centrolenella parabambae

NARIÑO
- Denbrobates tinctorius confluens
- Phyllobates boulengeri
  - brunneus
  - palmatus
  - latinasus
  - inguinalis
- Bufo typhonius
  - marinus
- Atelopus ignescens
  - varius bibroni
- Gastrotheca monticola argenteovirens
- Hyla buckleyi
  - guibei
  - rubra
- Smilisca phaeota
- Tetraprion jordani
- Eleutherodactylus conspicillatus
  - raniformis
  - longirostris
  - w-nigrum
  - lehmanni
- Leptodactylus insularum
  - poecilochilus diptychus
  - rubido
  - podicipinus petersi
- Trachyphrynus myersi
- Centrolenella buckleyi

NORTE DE SANTANDER
- Pipa parva
- Phyllobates palmatus
  - inguinalis
- Relictivomer pearsei
- Ctenophryne geayi
- Bufo haematiticus
  - marinus
  - granulosus humboldti
- Gastrotheca helenae
- Hyla crepitans
  - squalirostris
  - rubra
  - boulengeri
  - phlebodes
- Phyllomedusa nicefori
- Phrynohyas ingens
  - venulosa
- Ceratophrys calcarata
- Eleutherodactylus palmeri
  - cruentus
- Eupemphix pustulosus
- Leptodactylus insularum
  - mystaceus
  - poecilochilus diptychus
  - sibilatrix
  - podicipinus petersi
- Lithodytes lineatus

PUTUMAYO
- Dendrobates trivittatus
  - hahneli
- Phyllobates femoralis

PUTUMAYO—Continued
- Bufo typhonius
- Hyla lanciformis
  - calcarata
  - rhodoporus
  - rubra
  - boulengeri
- Osteocephalus taurinus
  - leprieuri
- Phyllomedusa blombergi
- Eleutherodactylus conspicillatus
  - longirostris
  - brederi
  - calcaratus
  - vertebralis
- Leptodactylus mystaceus
- Centrolenella medemi

SAN ANDRÉS Y PROVIDENCIA
- Leptodactylus insularum

SANTANDER
- Dendrobates lugubris
- Phyllobates palmatus
  - inguinalis
  - subpunctatus walesi
- Rana palmipes
- Relictivomer pearsei
- Bufo haematiticus
  - typhonius
  - marinus
- Atelopus longirostris
- Cryptobatrachus boulengeri
- Hyla crepitans
  - rubra
  - boulengeri
  - microcephala
- Phyllomedusa nicefori
- Eleutherodactylus conspicillatus
  - raniformis
  - brederi
  - nicefori
  - latidiscus latidiscus
  - cruentus
- Eupemphix pustulosus
- Leptodactylus insularum
  - podicipinus petersi
  - sibilatrix
- Niceforonia nana
- Physalaemus neglectus dunni

TOLIMA
- Dendrobates lugubris
- Phyllobates palmatus
- Rana palmipes
- Relictivomer pearsei
- Bufo granulosus humboldti
  - typhonius
  - marinus
- Atelopus ebenoides ebenoides
- Gastrotheca monticola argenteovirens
- Hyla crepitans
  - rubra
  - boulengeri
  - microcephala
- Phrynohyas venulosa
- Eleutherodactylus conspicillatus
  - raniformis
  - calcaratus
  - w-nigrum
  - sanctae-martae
  - latidiscus latidiscus
  - cruentus
  - vertebralis
  - cornutus cornutus
- Eupemphix pustulosus
- Leptodactylus rhodomystax
  - insularum
  - poecilochilus diptychus
  - sibilatrix

VALLE
- Phyllobates bicolor
  - boulengeri
  - femoralis
  - latinasus
  - inguinalis
- Rana palmipes
- Bufo granulosus humboldti
  - typhonius
  - marinus
  - blombergi
  - glaberrimus
  - haematiticus
- Atelopus pachydermus
  - longirostris
- Hyla crepitans
  - rosenbergi
  - maxima
  - albopunctulata
  - rubracyla
  - rubra
  - variabilis
- Smilisca phaeota
- Eleutherodactylus bufoniformis
  - conspicillatus
  - anomalus
  - raniformis

VALLE—Continued
- longirostris
- brederi
- surdus cabrerai
- latidiscus latidiscus
- lehmanvalenciae
- erythropleurus
- gularis
- Leptodactylus pentadactylus
  - rubido
  - podicipinus petersi

VAUPÉS
- Bufo glaberrimus
  - granulosus humboldti
  - marinus
- Hyla lanciformis
  - maxima

VAUPÉS—Continued
- cabrerai
- granosa
- boulengeri
- sarayacuensis
- hobbsi
- Osteocephalus taurinus
  - leprieuri
- Phrynohyas venulosa
- Eleutherodactylus terraebolivaris
  - affinis
- Leptodactylus rhodomystax
  - sibilatrix
- Centrolenella buckleyi

VICHADA
- Elachistocleis ovalis
- Hyla calcarata

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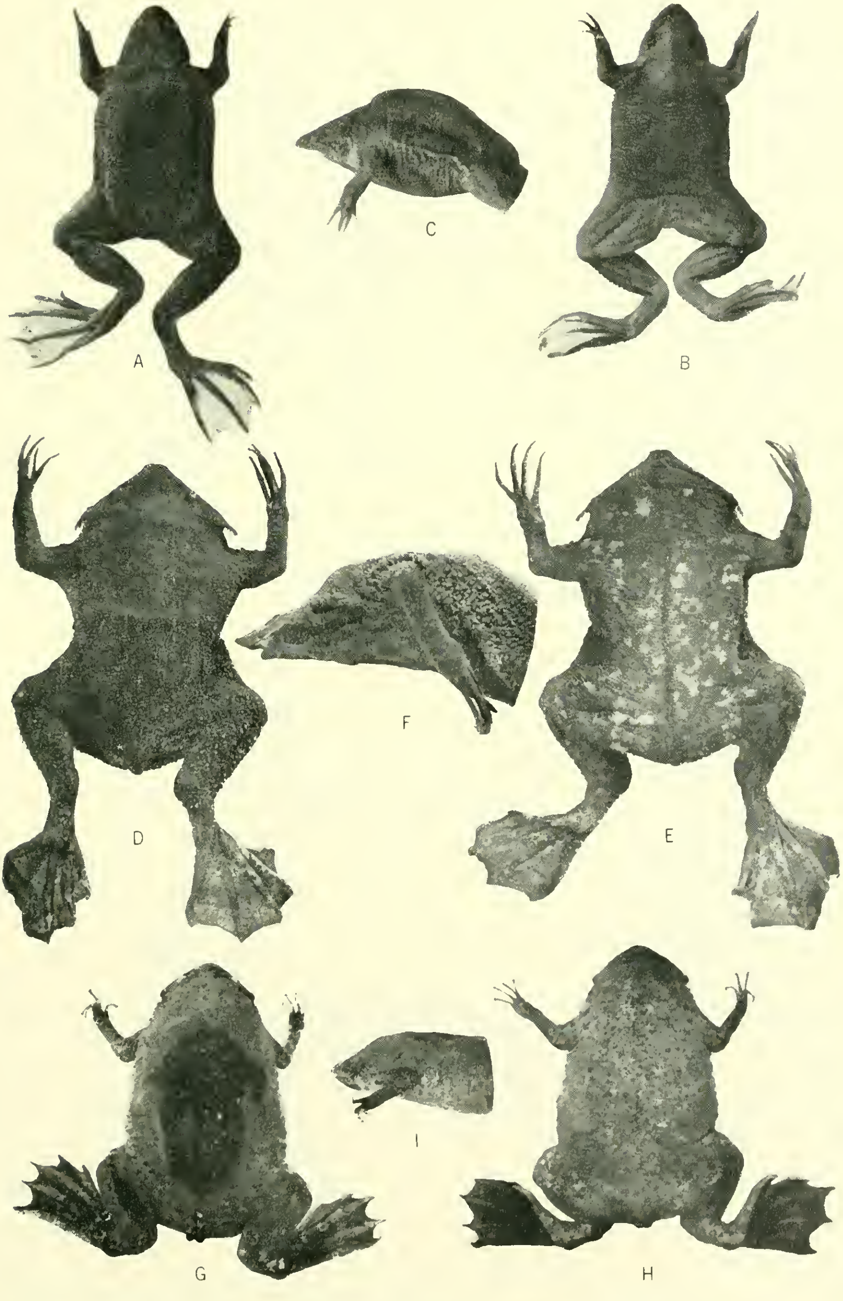


PLATE 1.—A–C: *Pipa parva*, MLS 270 (× 0.7). D–F: *P. pipa*, MLS 810 (× 0.3). G–I: *P. snethlageae*, WTN 2561 (× 0.4).

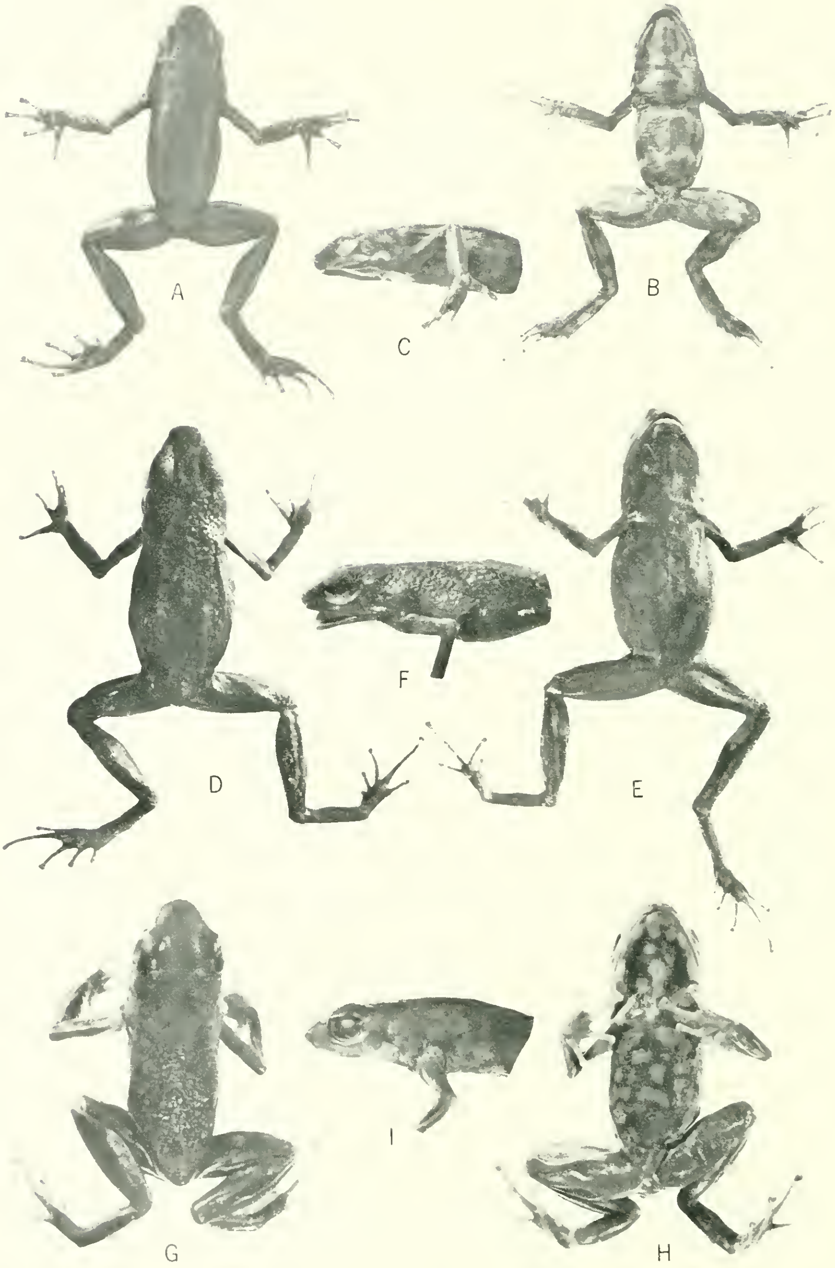


PLATE 2.—A–C: *Dendrobates lugubris*, USNM 146850 (same size). D–F: *D. ingeri*, holotype, USNM 146846 (× 1.3). G–I: *D. opisthomelas*, BM 1947.2.15.30 (× 2.1).

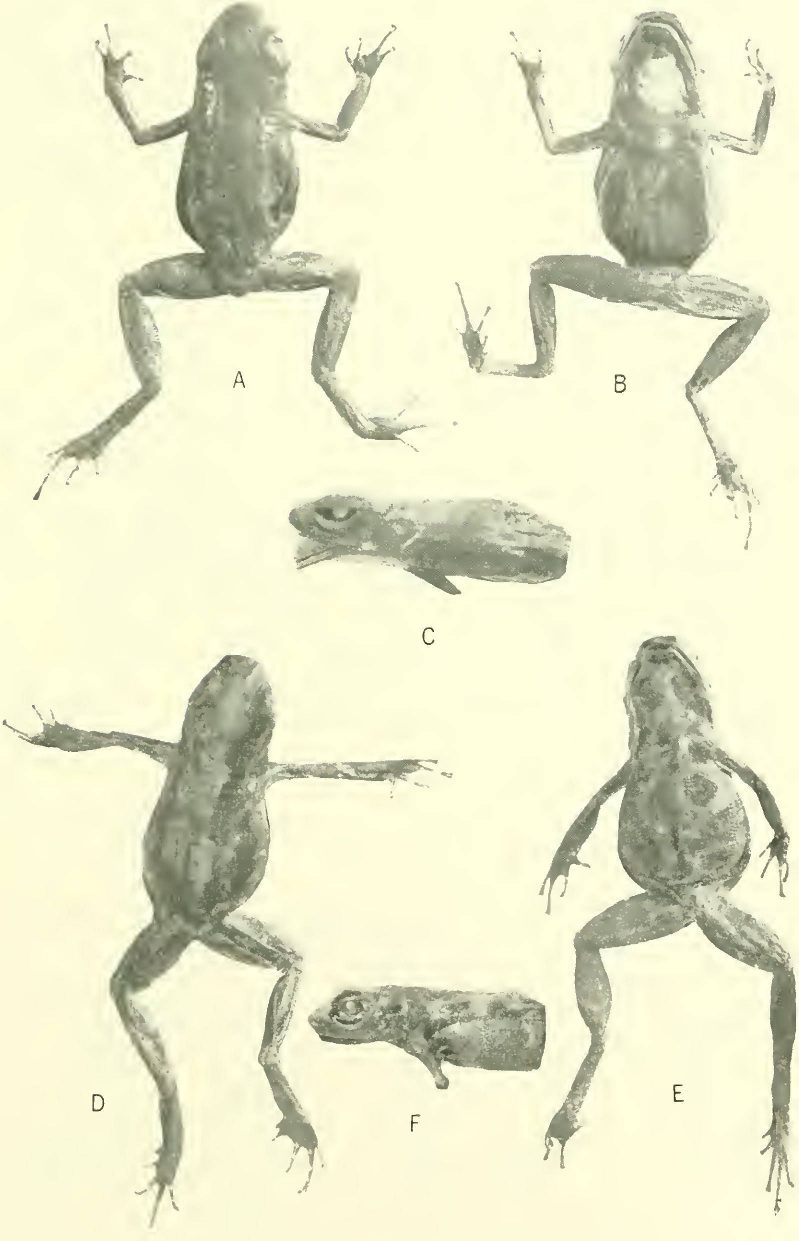


Plate 3.—a–c: *Dendrobates minutus minutus*, USNM 144980 (× 2.2). d–f: *D. minutus ventrimaculatus*, USNM 146843 (× 2.4).

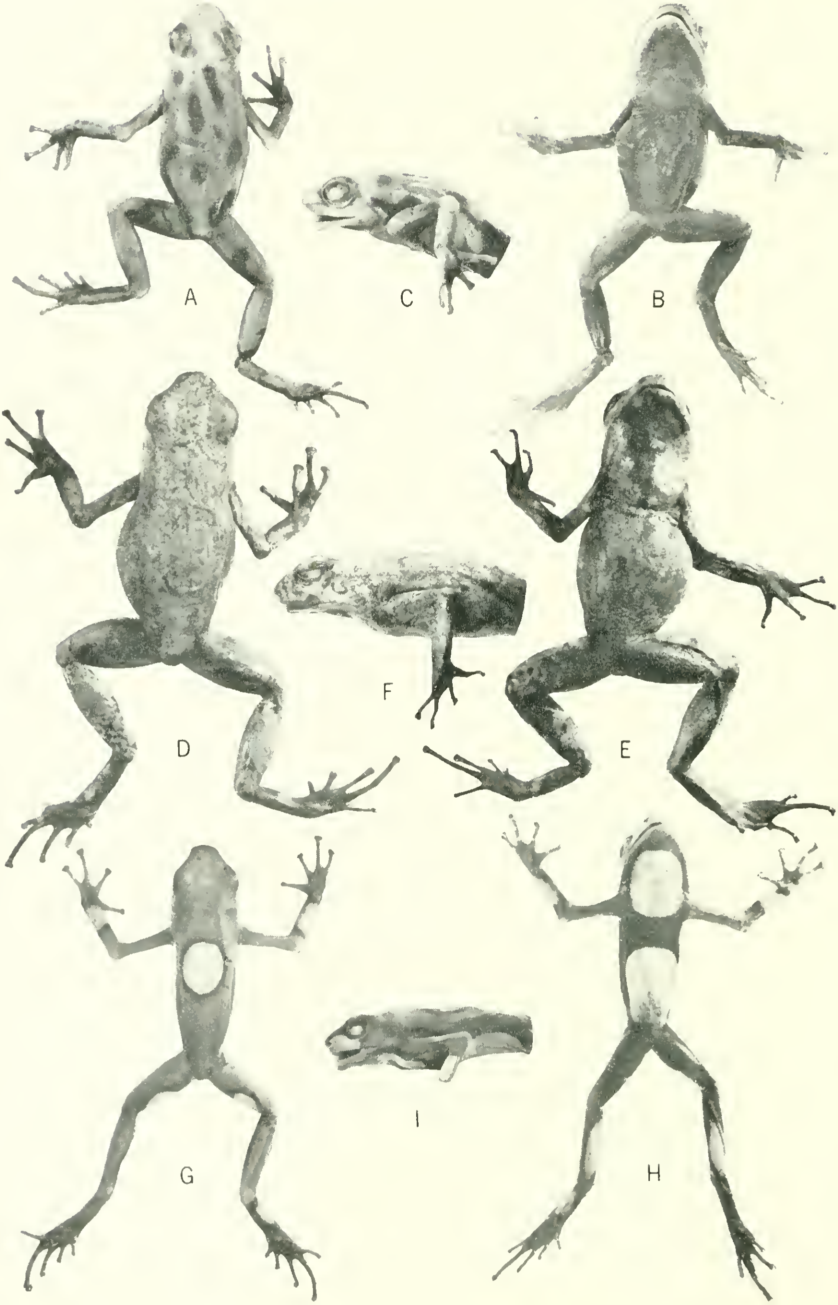


PLATE 4.—A–C: *Dendrobates tinctorius chocoensis,* USNM 124264 (× 0.9). D–F: *D. tinctorius confluens,* paratype, USNM 145800 (× 1.2). G–I: *D. tinctorius histrionicus,* USNM 139778 (× 0.9).

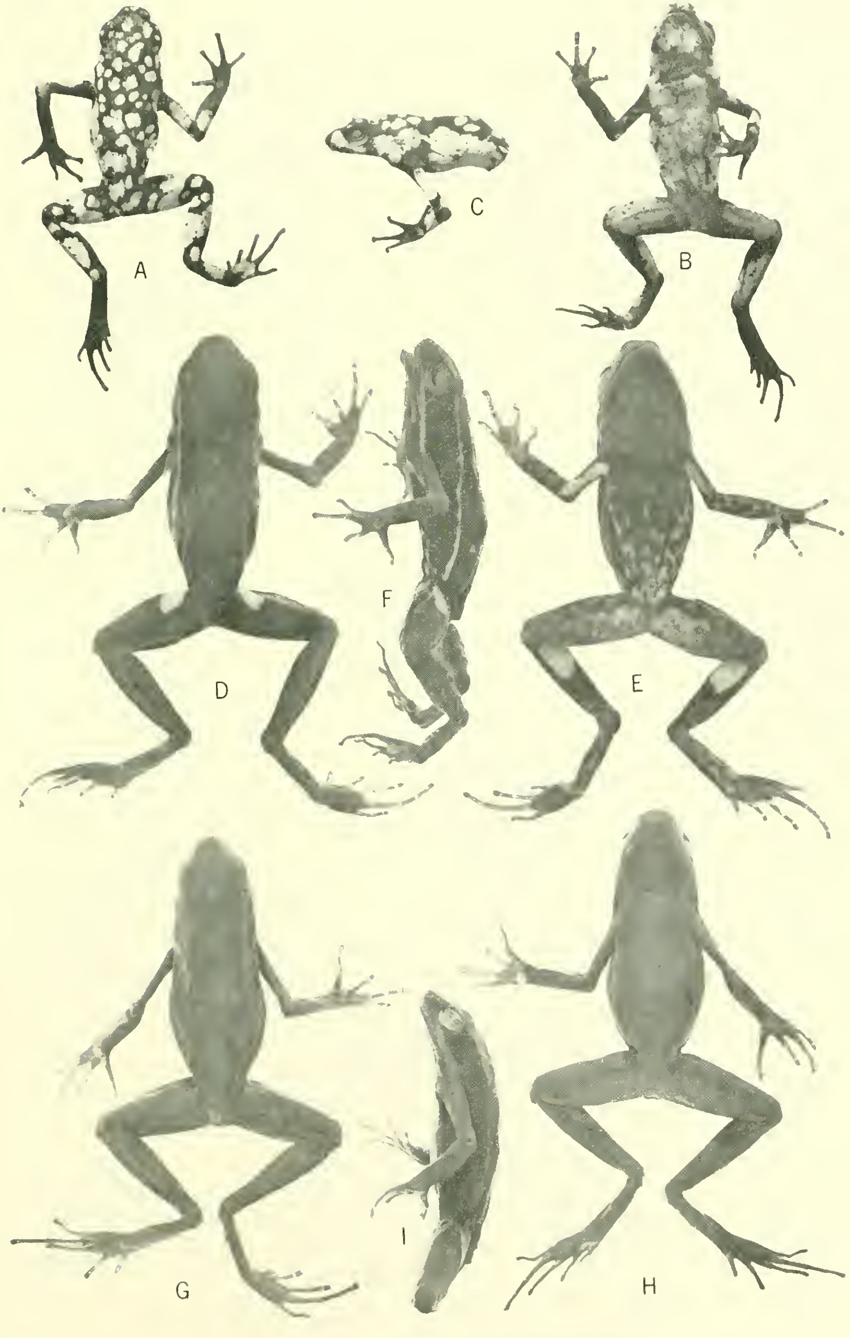


PLATE 5.—A–C: *Dendrobates tinctorius wittei,* USNM 124223 (× 0.8). D–F: *D hahneli,* USNM 144965 (× 1.8), G–I: *D. trivittatus,* USNM 146832 (× 0.9).

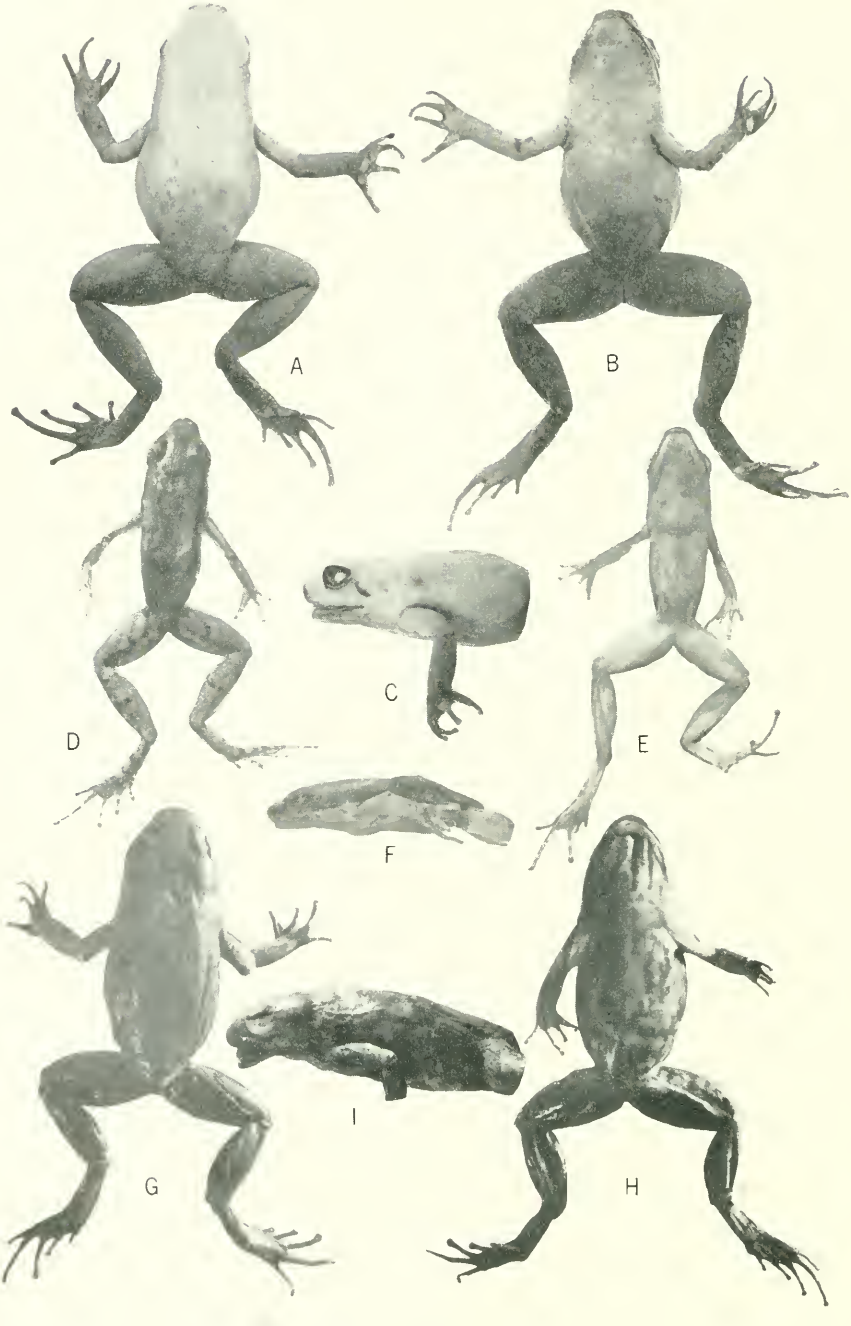


PLATE 6.—A–C: *Phyllobates bicolor,* USNM 137360 (× 0.9). D–F: *P. brunneus,* USNM 146907 (× 1.3). G–I: *P. mertensi,* holotype, CNHM 54456 (× 1.2).

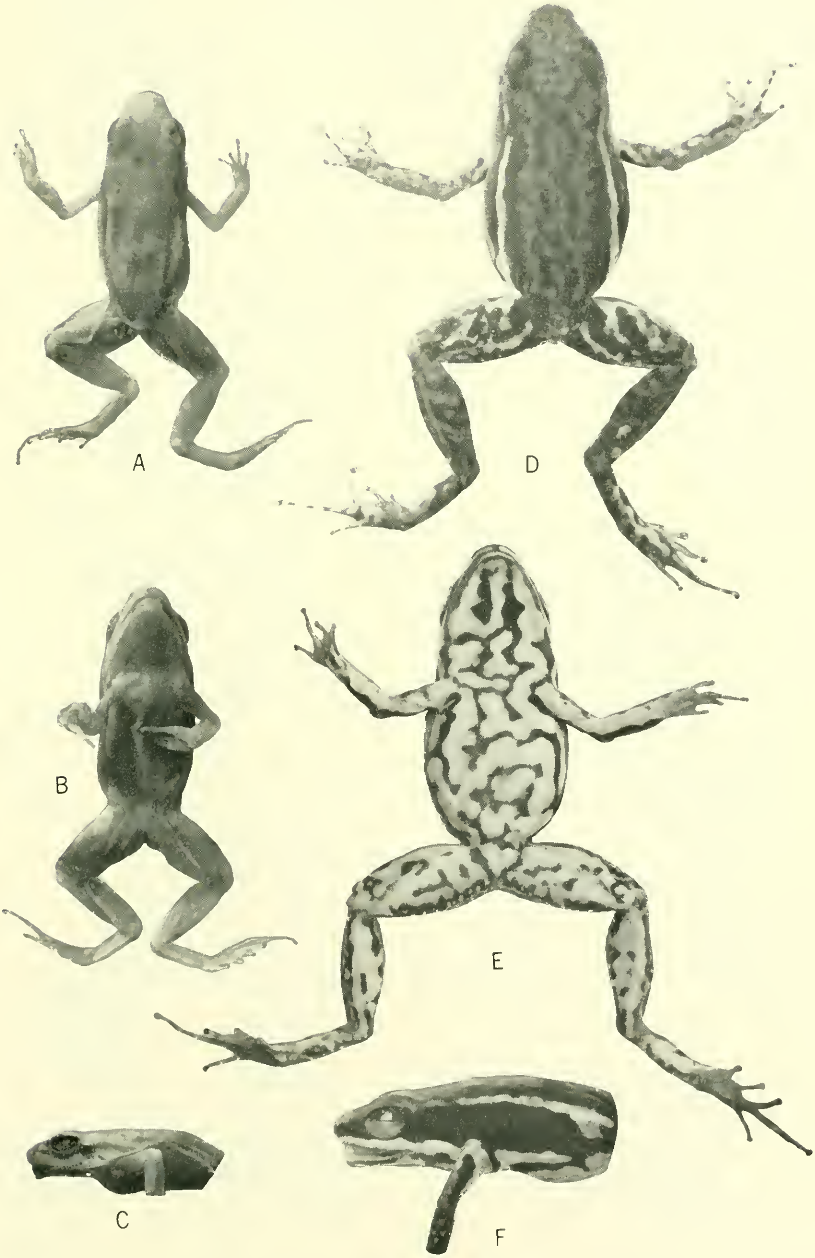


PLATE 7.—*Phyllobates boulengeri:* A–C, cotype, USNM 52406 (× 1.5); D–F, USNM 145268 (× 2.1).

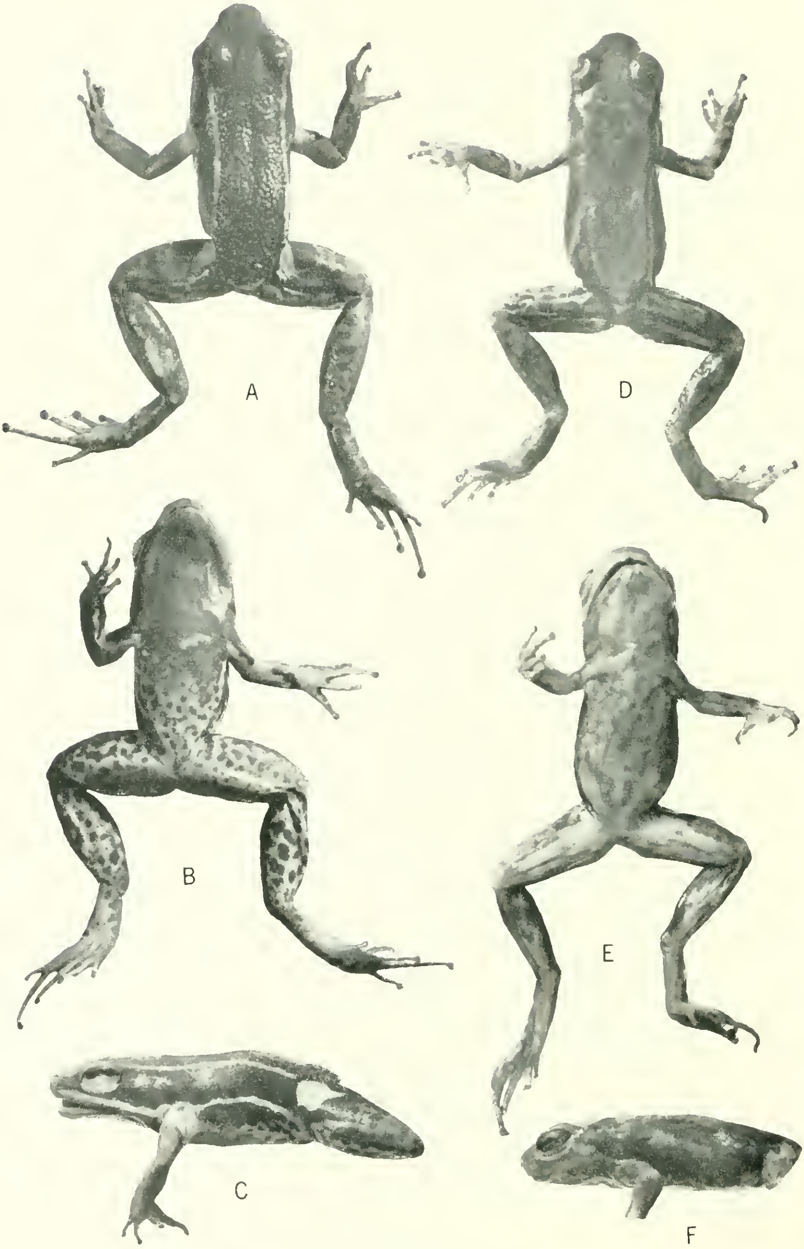


Plate 8.—a–c: *Phyllobates femoralis*, USNM 146872 (× 1.5). d–f: *P. thorntoni*, holotype, AMNH 1347 (× 1.4).

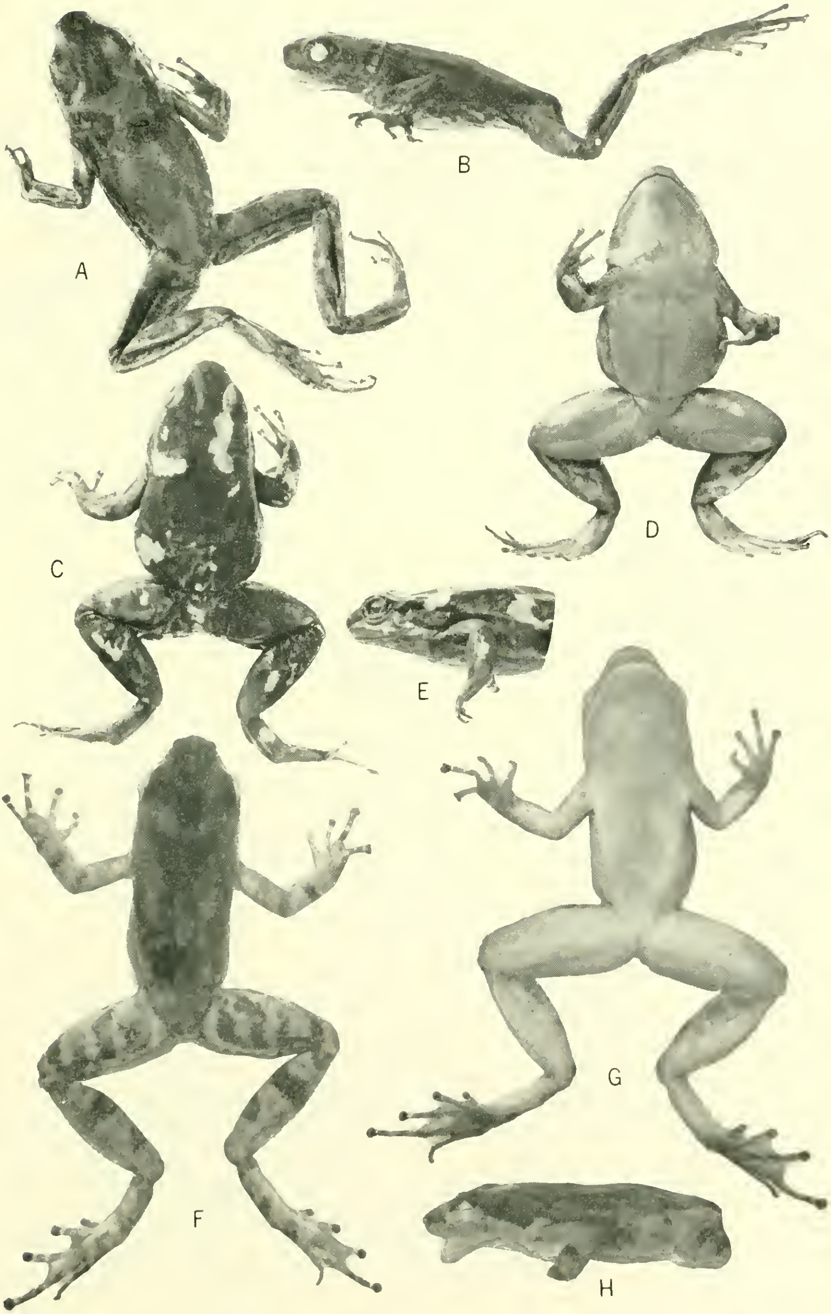


PLATE 9.—A,B: *Phyllobates chocoensis*, BM 1929.2.1.5 (× 1.4). C–E: *P. palmatus*, USNM 147132 (× 1.5). F–H: *P. vergeli*, MLS 309 (× 1.8).

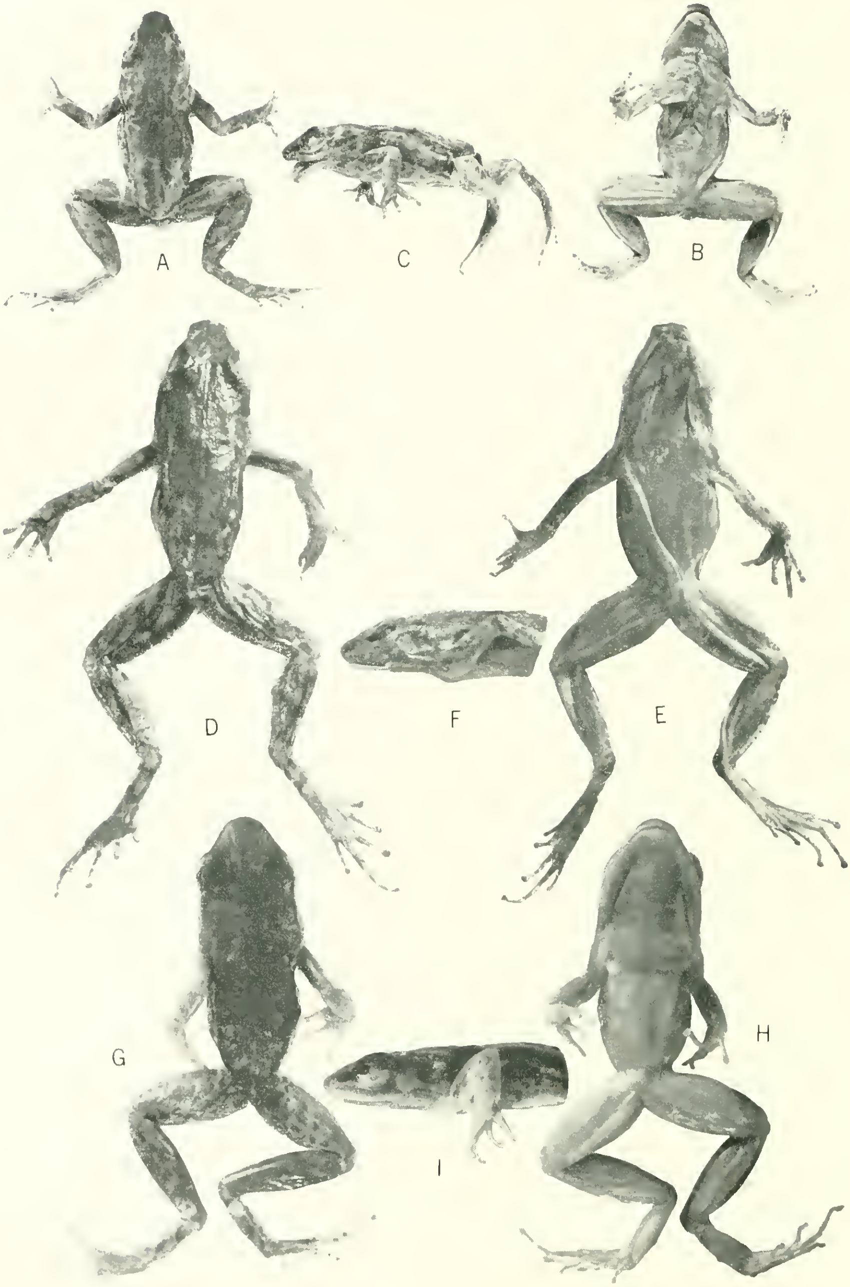


PLATE 10.—A–F, *Phyllobates inguinalis:* A–C, holotype, USNM 4349 (× 2); D–F, USNM 146931 (× 1.5). G–I: *P. latinasus*, ANSP 25386 (× 1.3).

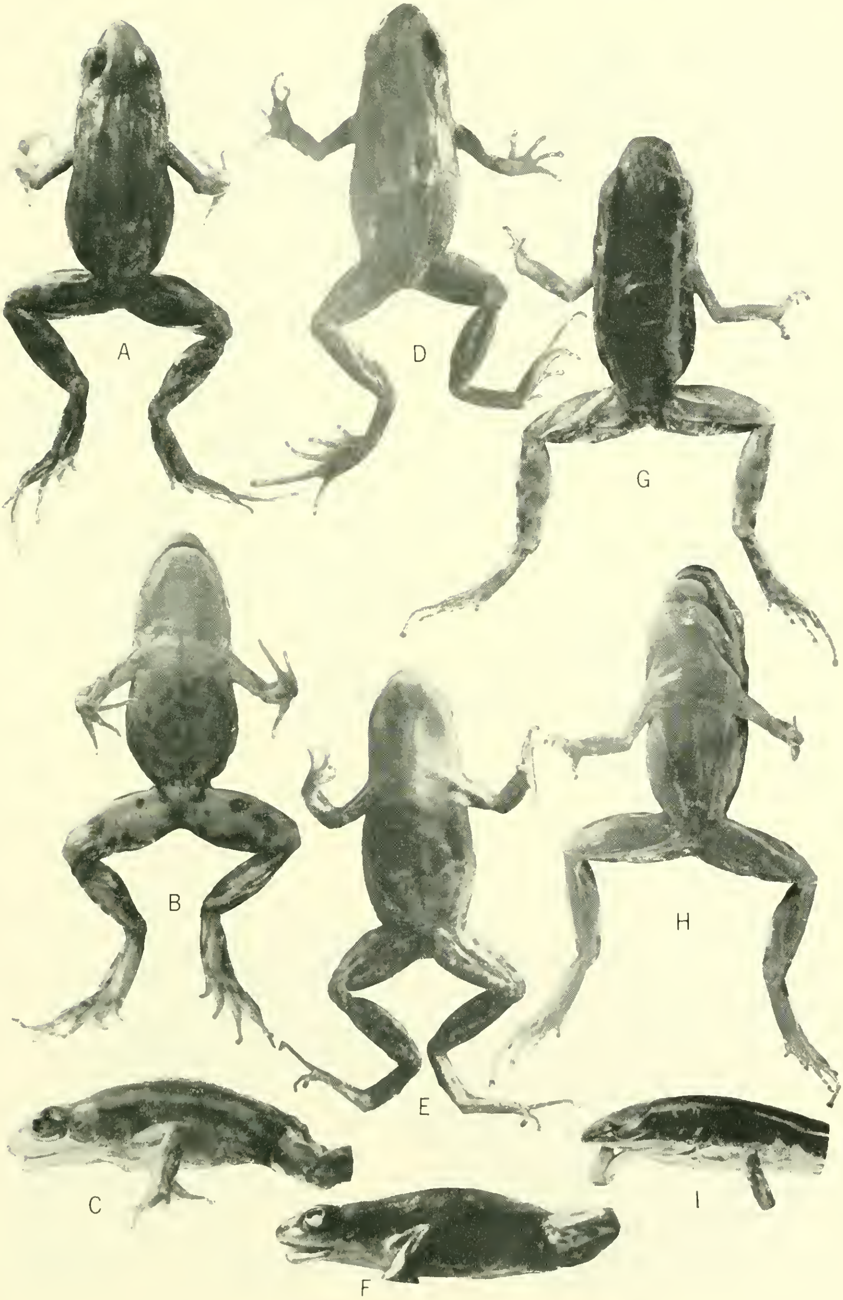


PLATE 11.—A–C: *Phyllobates subpunctatus subpunctatus*, CNHM 81887 (× 1.8). D–F: *P. subpunctatus walesi*, holotype, SUNHM 20290 (× 1.6). G–I: *P. pratti*, BM 1914.5.21.77 (× 2.2).

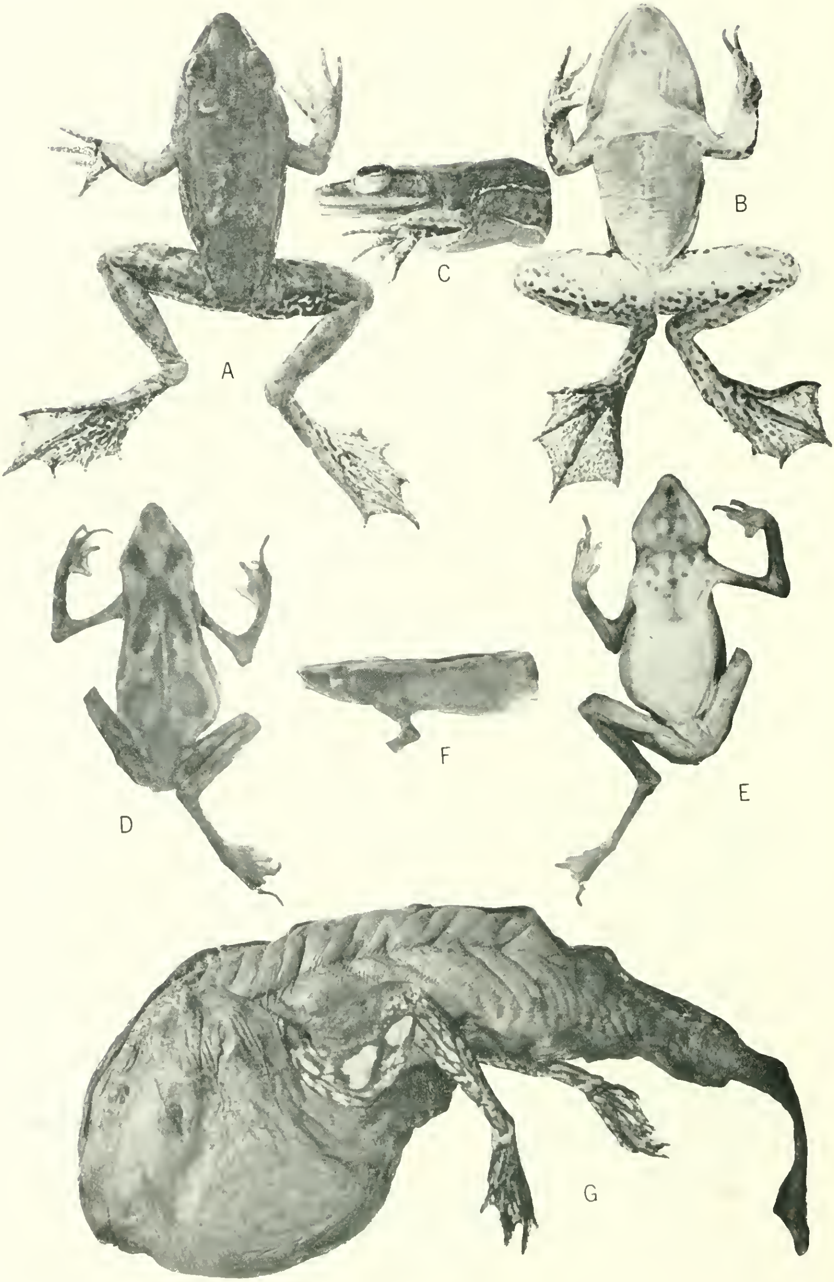


PLATE 12.—A–C: *Rana palmipes,* USNM 142198 (× 0.5). D–F: *Atelopus longirostris,* CNHM 43851 (× 0.8). G: Larva of *Pseudis paradoxa nicefori,* USNM 145780 (× 0.8).

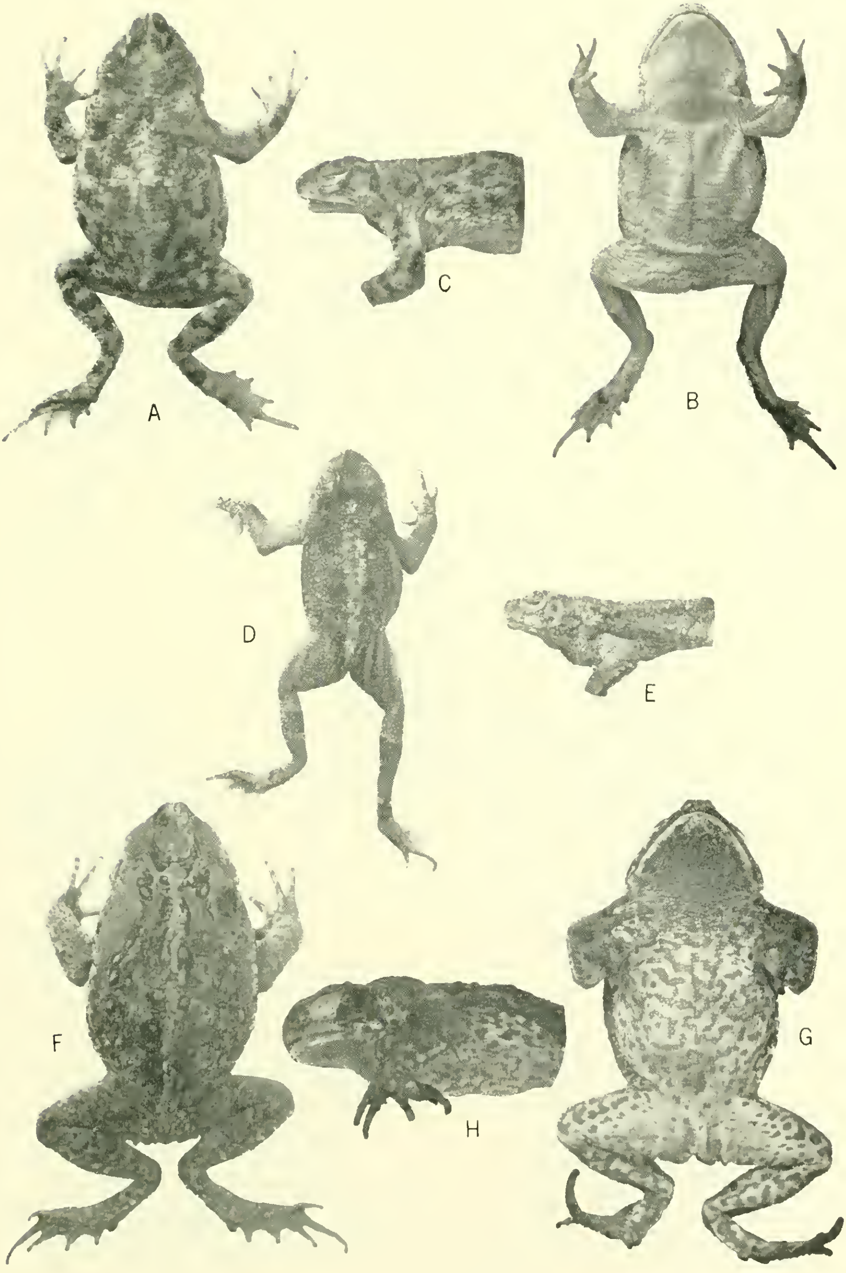


PLATE 13.—A–C: *Bufo granulosus humboldti*, USNM 146815 (same size). D,E: *B. sternosignatus*, BM 68.9.15.1 (× 0.8). F–H: *B. marinus*, USNM 144619 (× 0.5).

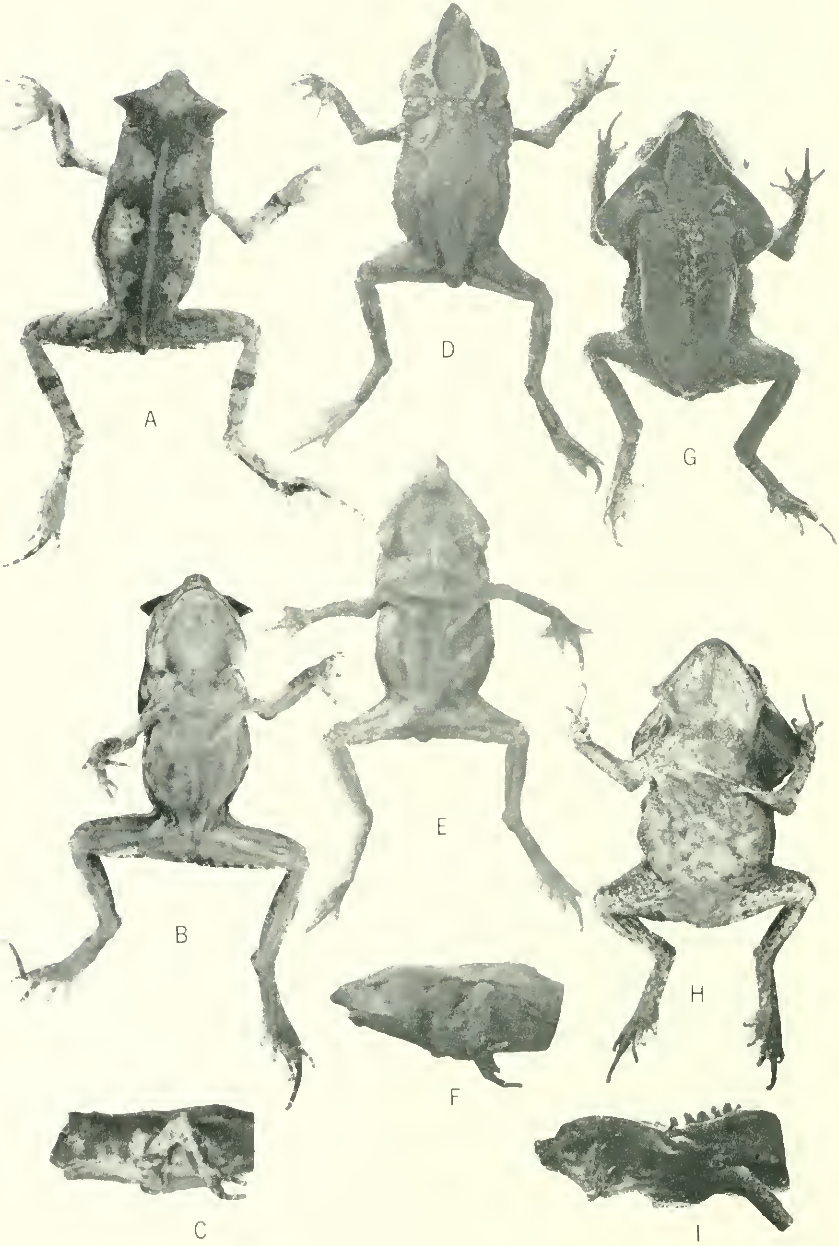


PLATE 14.—A–C: *Bufo ceratophrys*, MLS 50 (× 1.6). D–F: *B. rostratus rostratus*, paratype, AMNH 1384 (same size). G–I: *B. typhonius*, USNM 146824 (× .05).

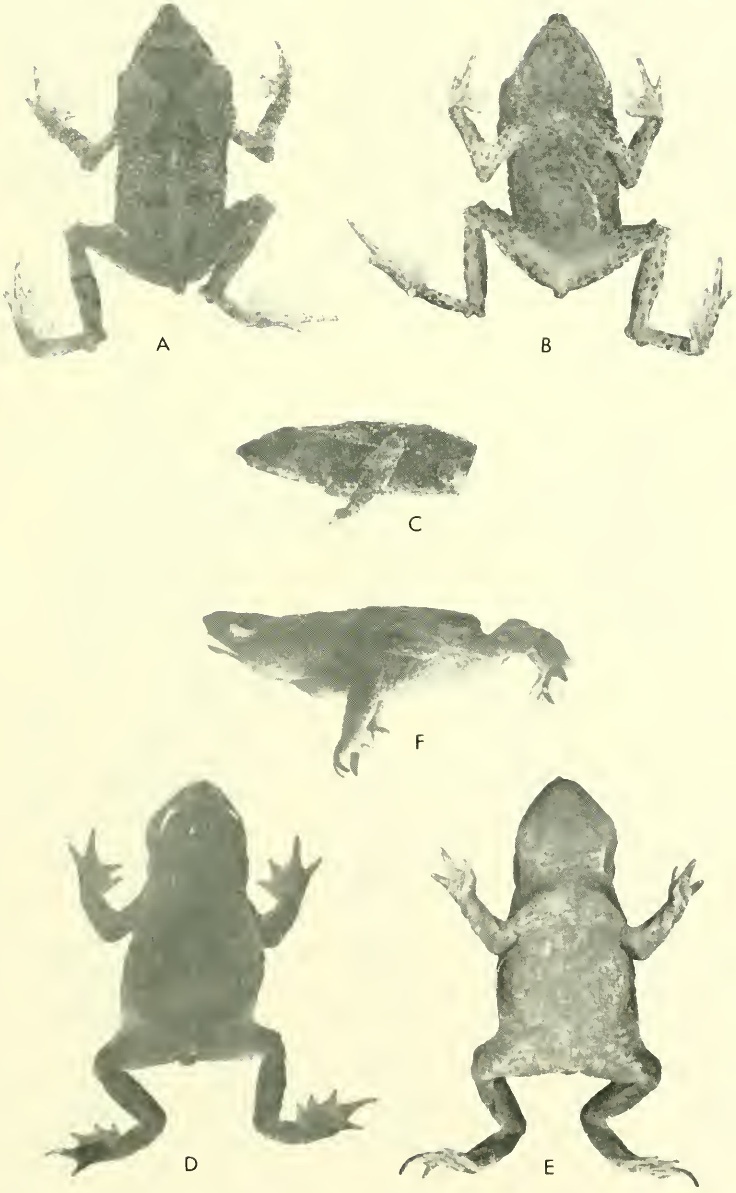


PLATE 15.—A–C: *Bufo typhonius*, MLS 427, a badly dried juvenile. D–F: *B. rostratus nicefori*, holotype, USNM 163476 (same size).

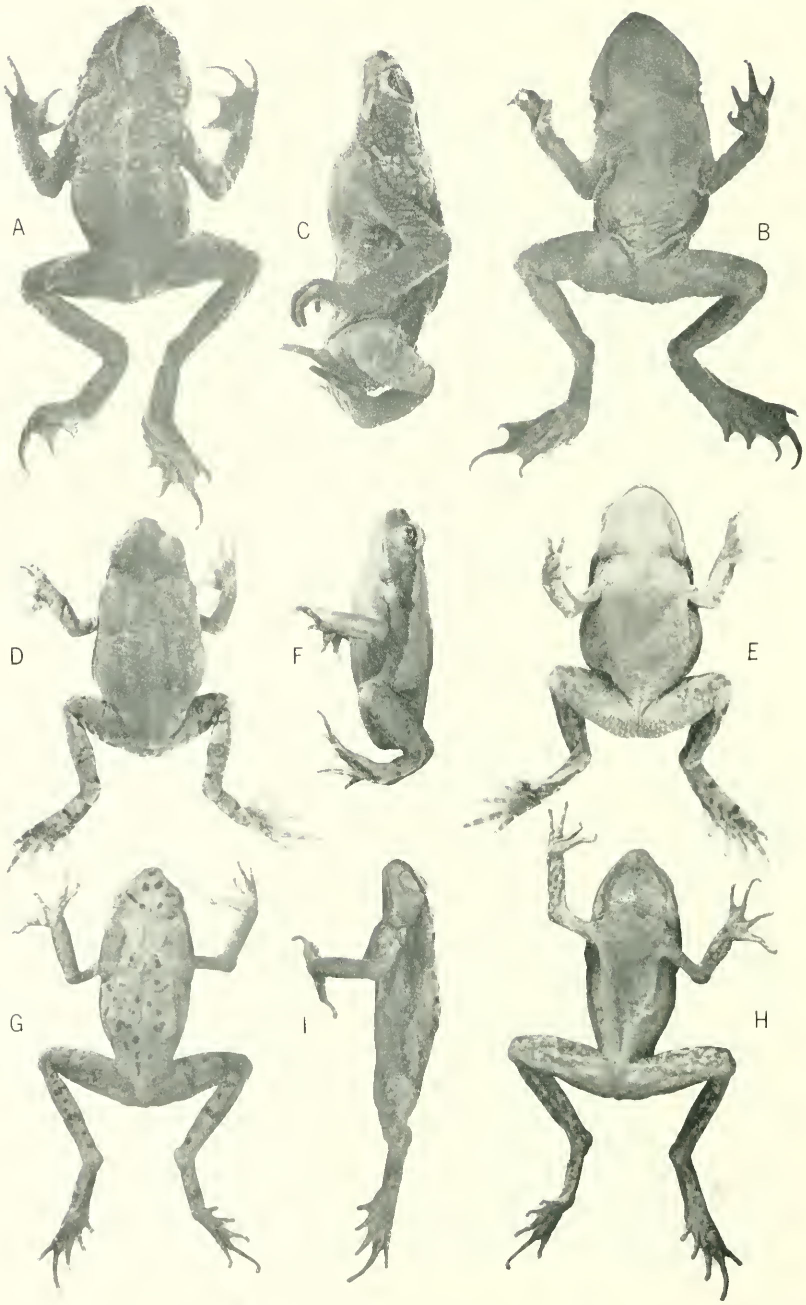


Plate 16.—a–c: *Bufo coniferus,* holotype, USNM 4335 (× 0.5). d–f: *B. glaberrimus,* USNM 144566 (× 0.8). g–i: *B. haematiticus,* MLS 249 (× 0.7).

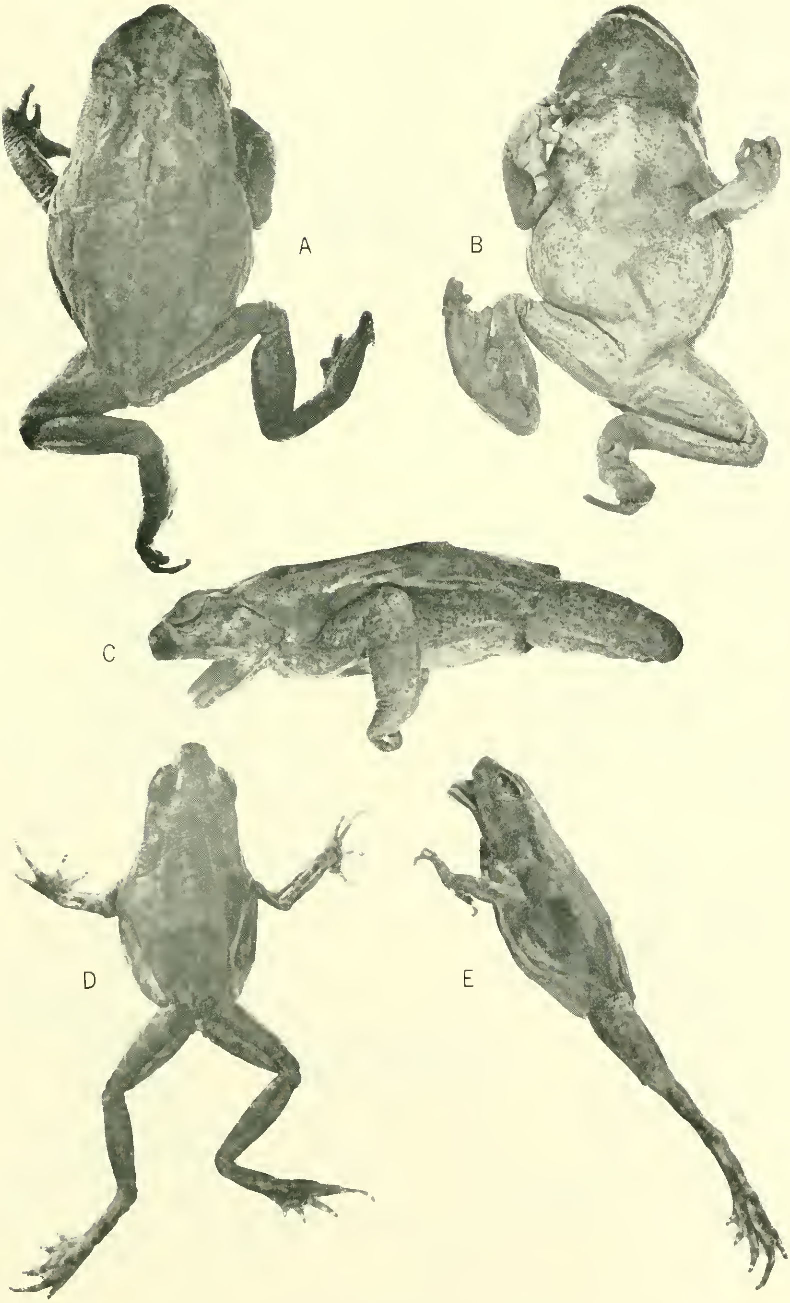


Plate 17.—a–c: *Bufo blombergi*, USNM 142101 (× 0.25). d–f: *B. hypomelas*, AMNH 14031 (× 1.6).

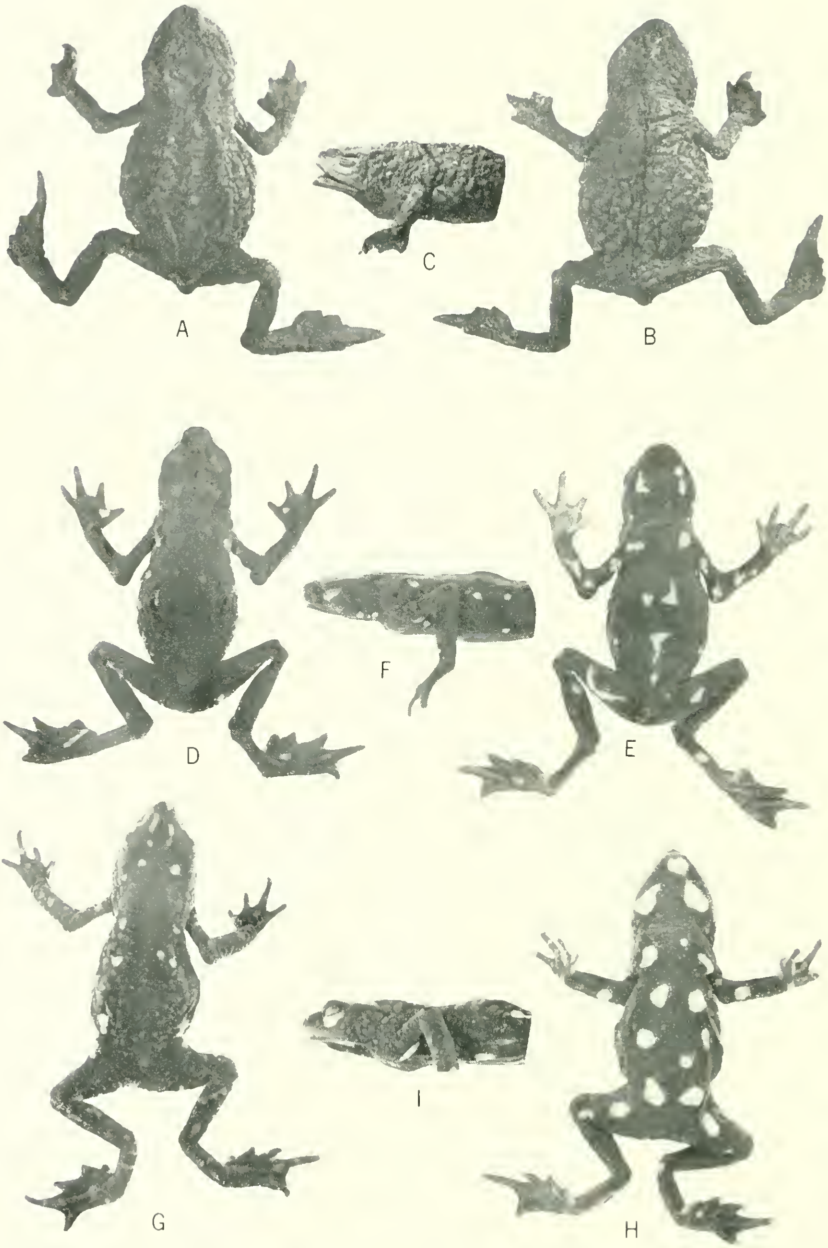


PLATE 18.—A–C: *Atelopus bufoniformis*, MLS 143 (× 1.3). D–F: *A. ebenoides ebenoides*, holotype, CNHM 69746 (× 0.8). G–I: *A. ebenoides marinkellei*, holotype, USNM 150644 (× 0.8).

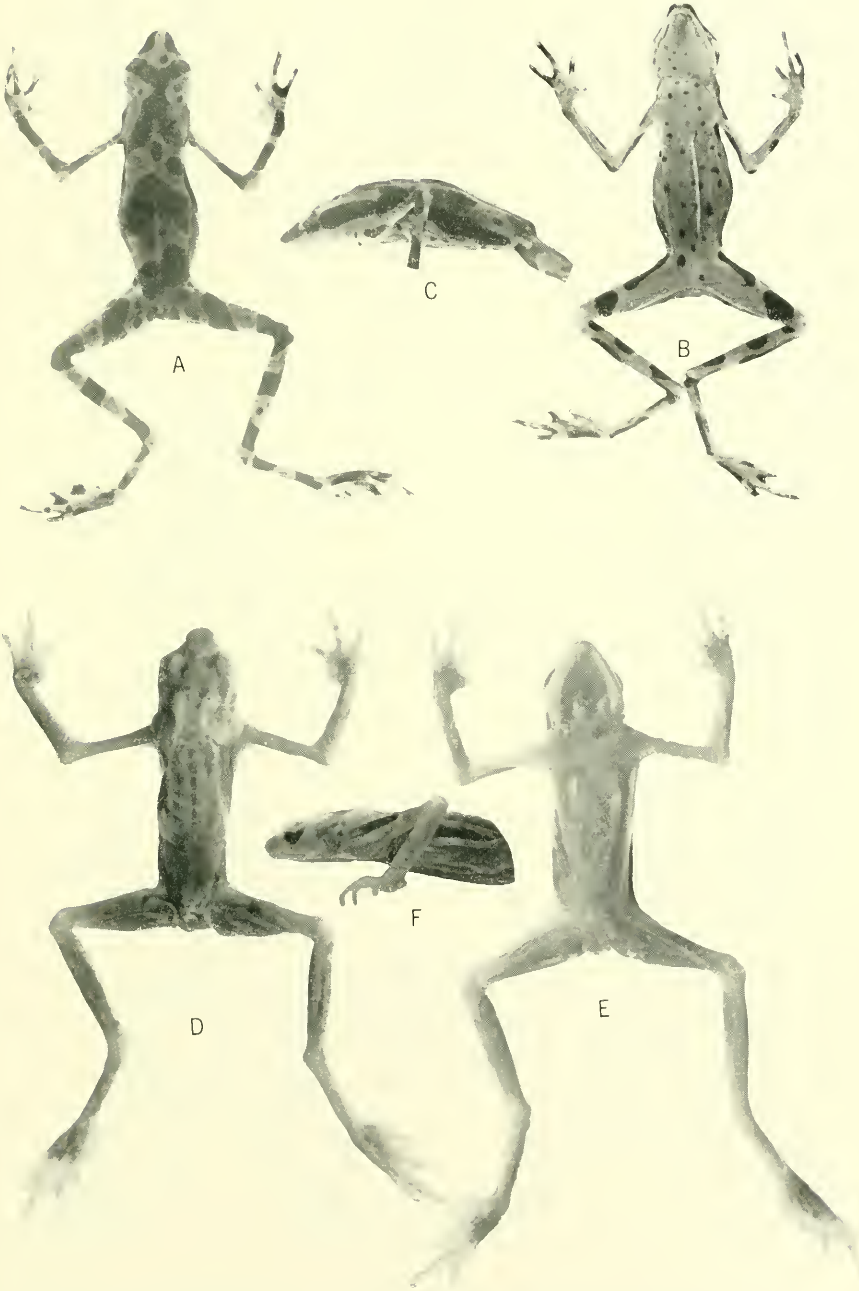


Plate 19.—A–C: *Atelopus spurrelli*, USNM 144933 (× 1.3). D–F: A. *varius elegans*, USNM 52401, cotype of *A. gracilis* (× 1.2).

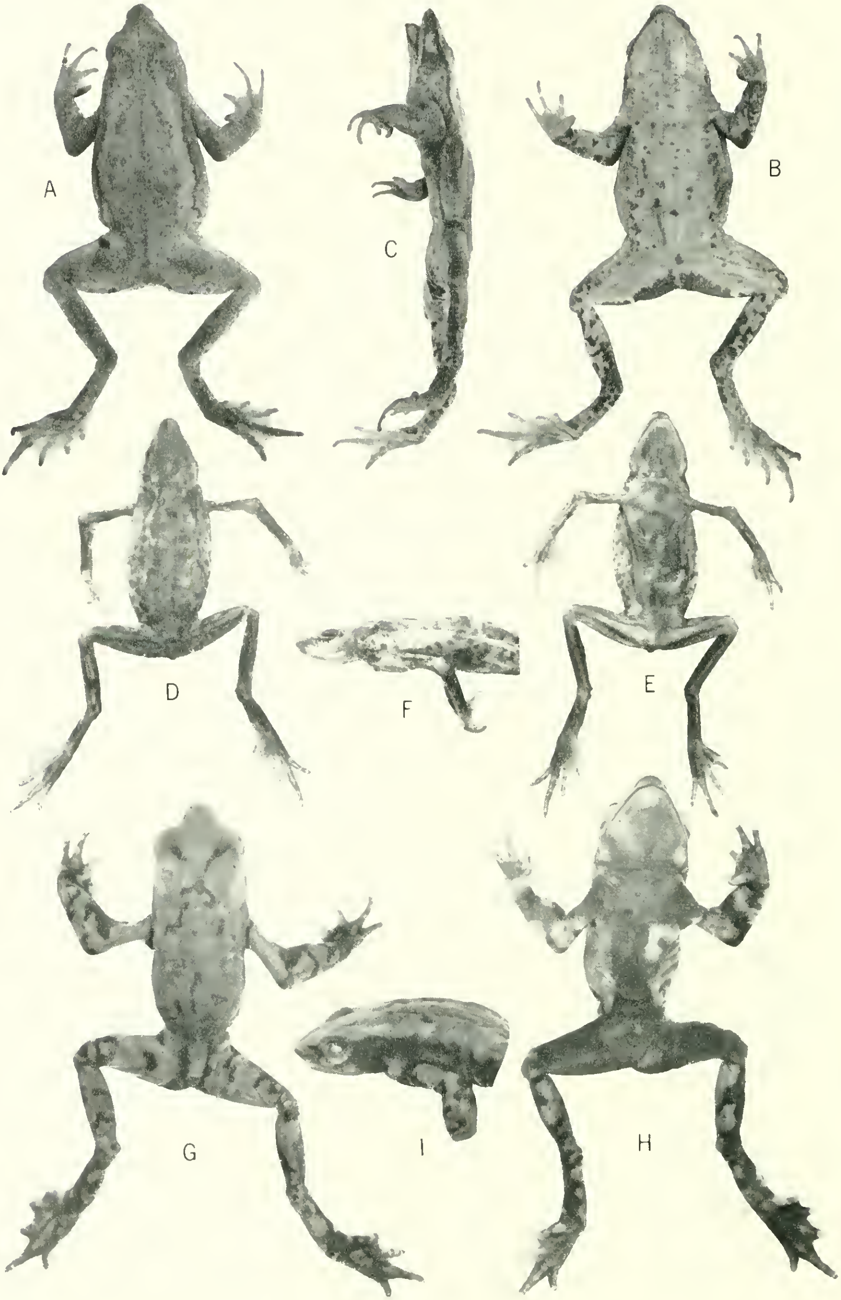


PLATE 20.—A–C: *Atelopus walkeri*, holotype, MZUM 48007 (same size). D–F: *A. varius subornatus*, USNM 95177 (× 0.8). G–I: *A. pedimarmoratus*, holotype, CNHM 81872 (× 1.3).

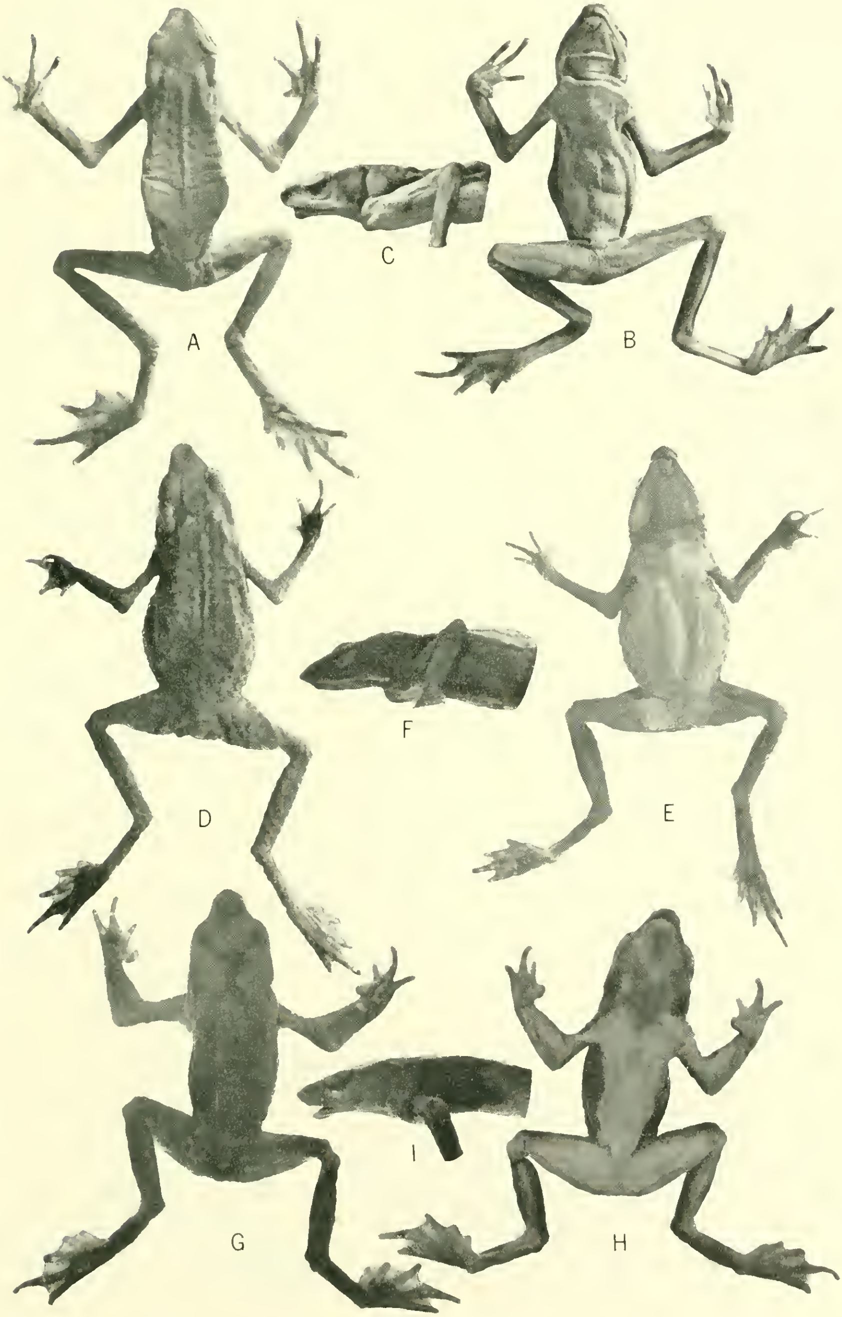


PLATE 21.—A–C: *Atelopus varius glyphus*, holotype, USNM 50230 (× 0.8). D–F: *A. varius bibroni*, USNM 147505 (× 1.2). G–I: *A. nicefori*, holotype, CNHM 69748 (× 1.5).

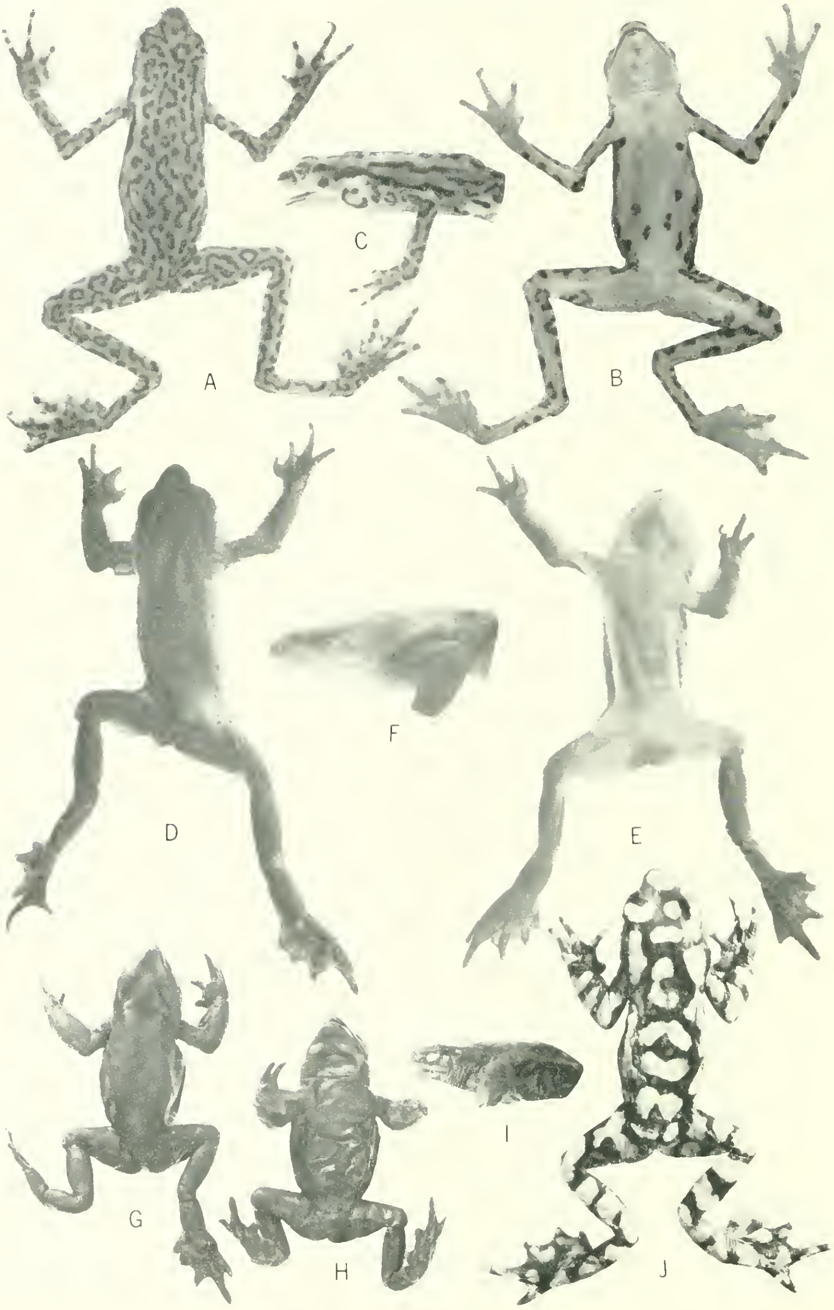


PLATE 22.—A–C: *Atelopus longibrachius*, holotype, CNHM 54283 (same size). D–F: *A. ignescens*, USNM 118220 (× 1.2). G–J, *A. carrikeri*: G–I, MCZ 4100 (× 0.6); J, USNM 123560 (× 0.8).

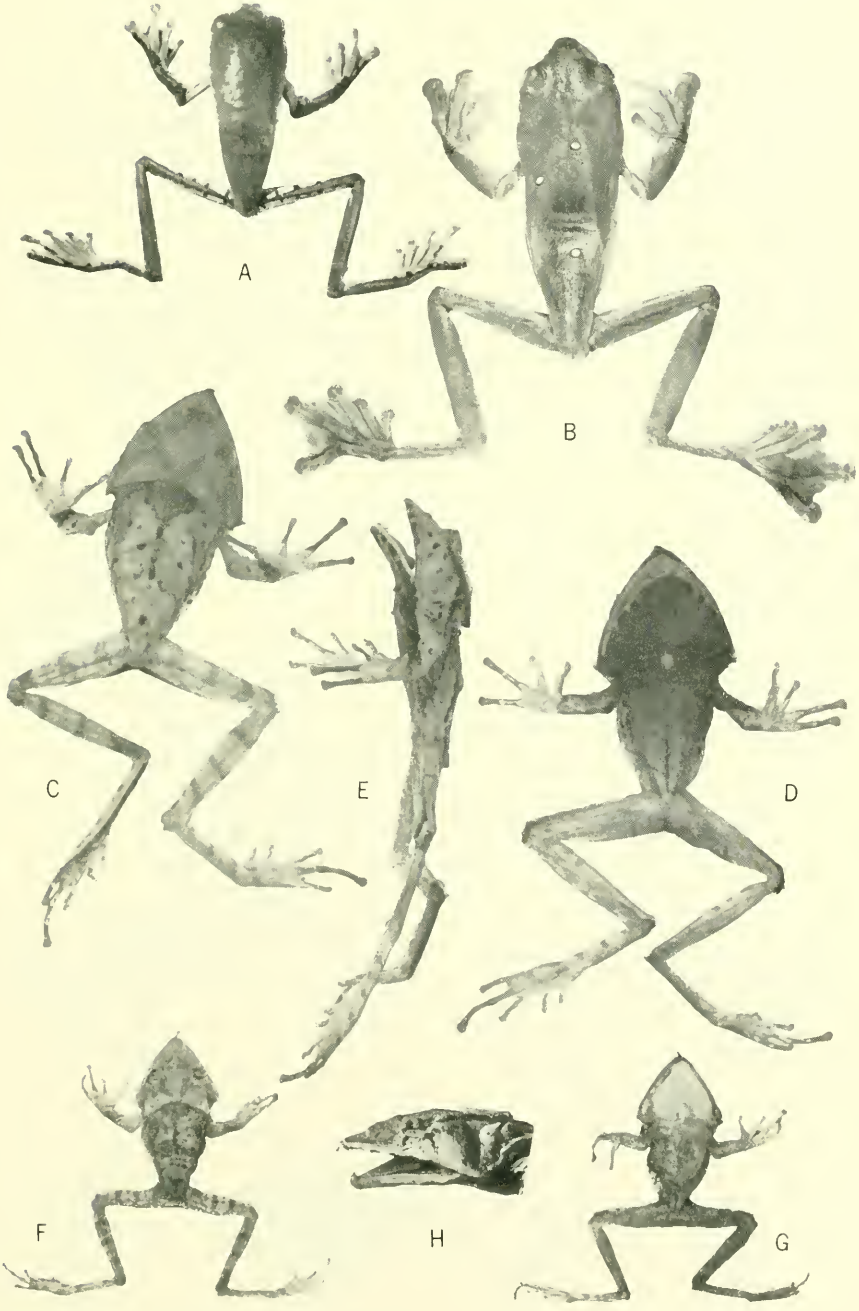


PLATE 23.—A: *Agalychnis calcarifer*, BM 1913.11.12.126 (× 0.5). B: *A. spurrelli*, cotype, BM 1913.11.12.129 (× 0.5). C–E: *Cerathyla johnsoni*, CNHM 63850 (× 0.8). F–H: *C. proboscidea*, BM 1910.7.11.71 (× 0.5).

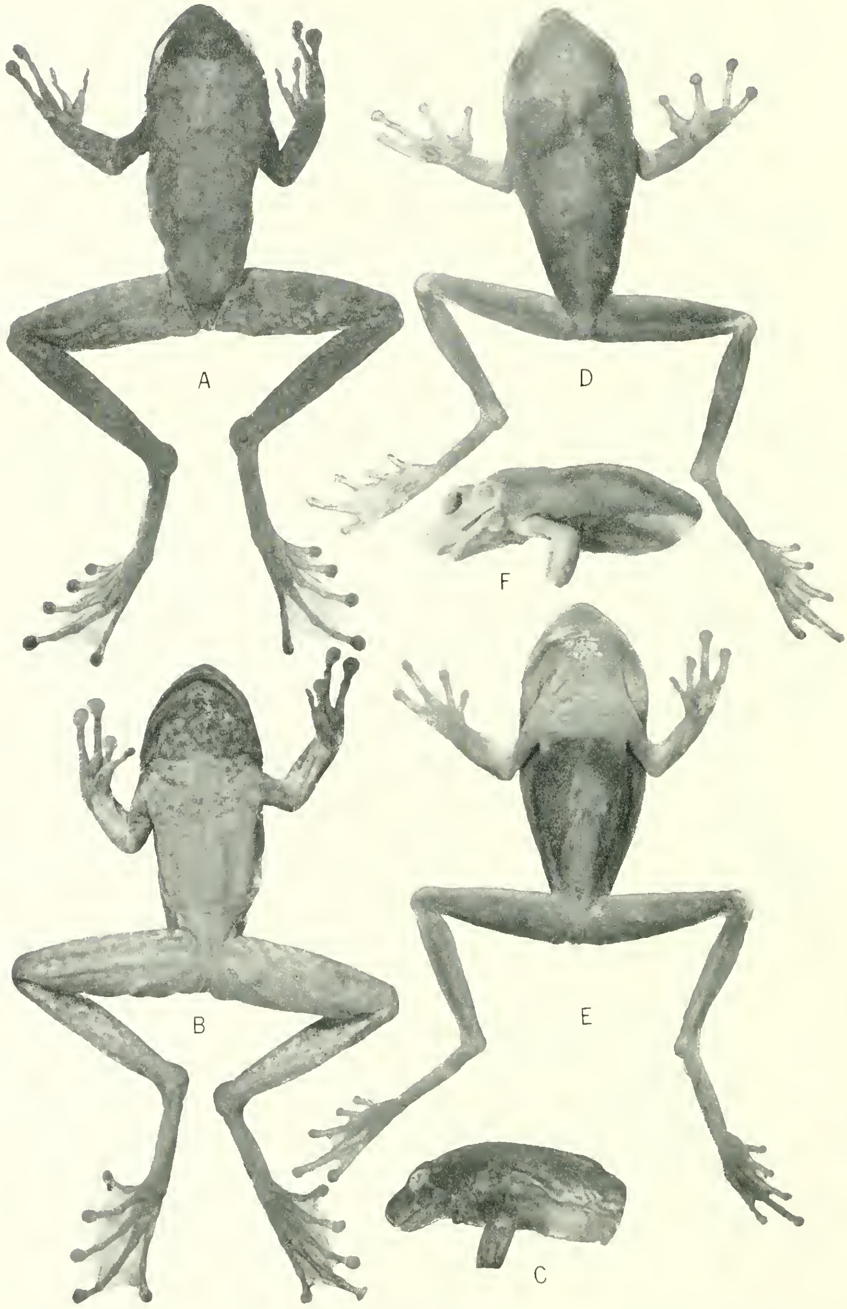


PLATE 24.—A–C: *Cryptobatrachus boulengeri*, MLS 202 (× 1.3). D–F: *Hyla punctata*, UF 8518-1 (× 1.2).

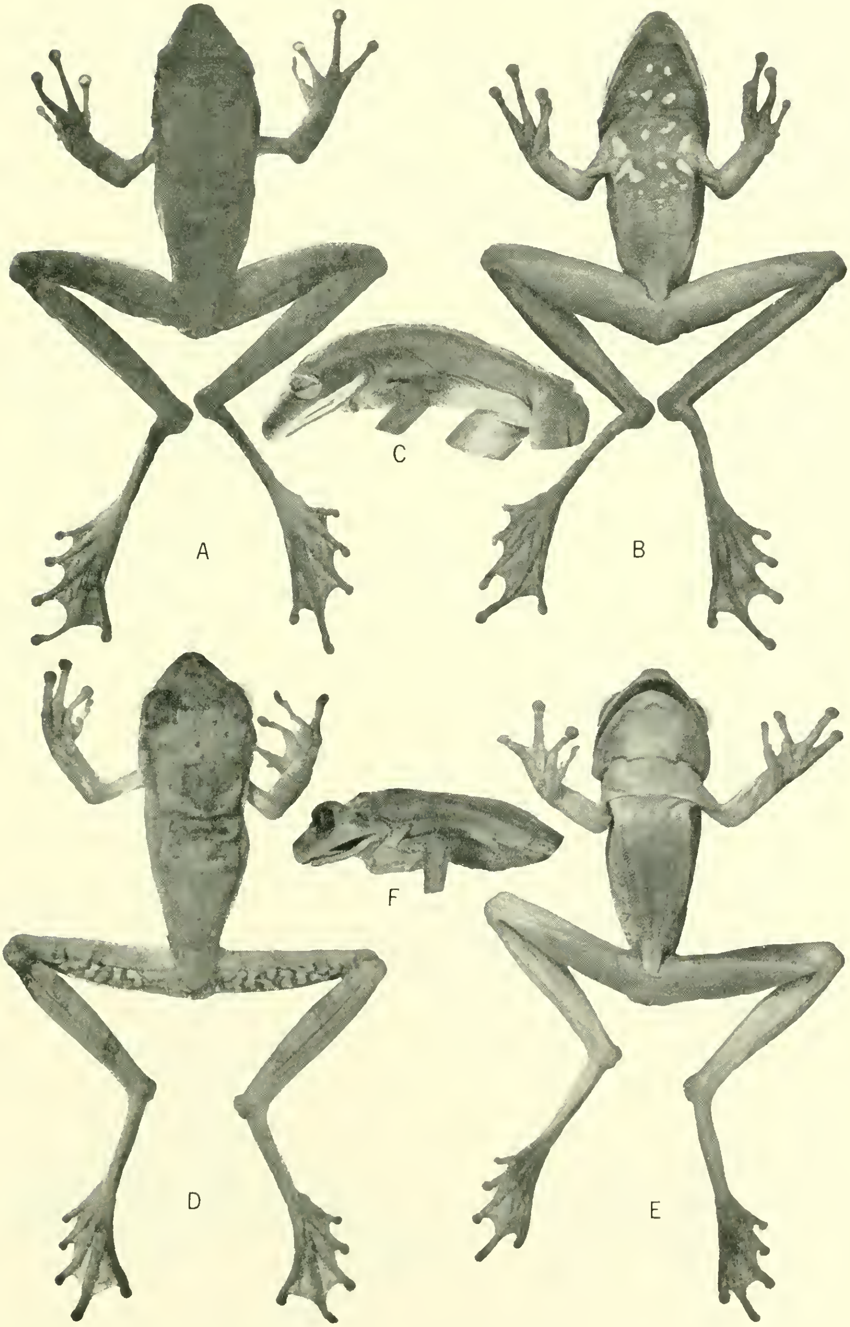


PLATE 25.—A–C: *Hyla lanciformis,* USNM 152036 (× 0.7). D–F: *H. crepitans,* CNHM 61169 (× 0.7).

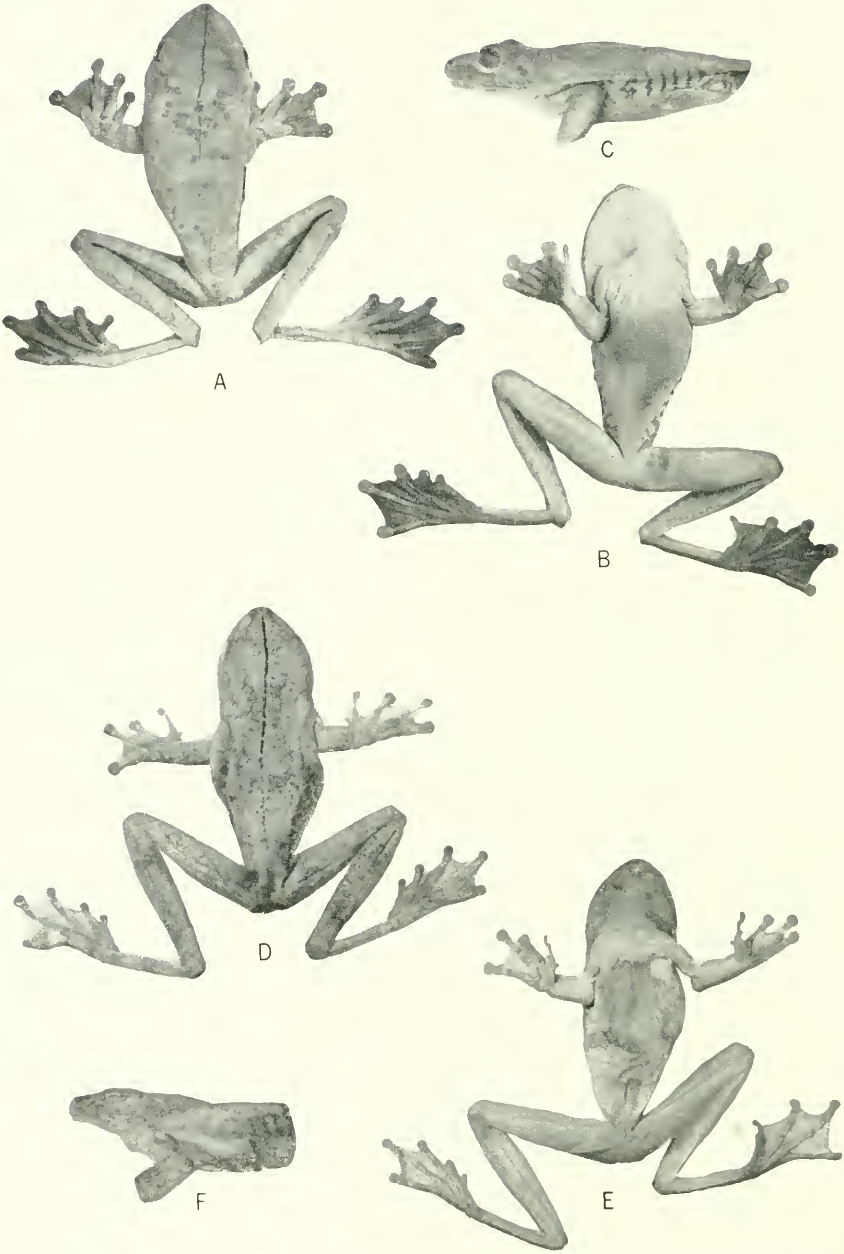


Plate 26.—a–c: *Hyla maxima*, CNHM 54789 (× 0.4). d–f: *H. rosenbergi*, CNHM 61167 (× 0.5).

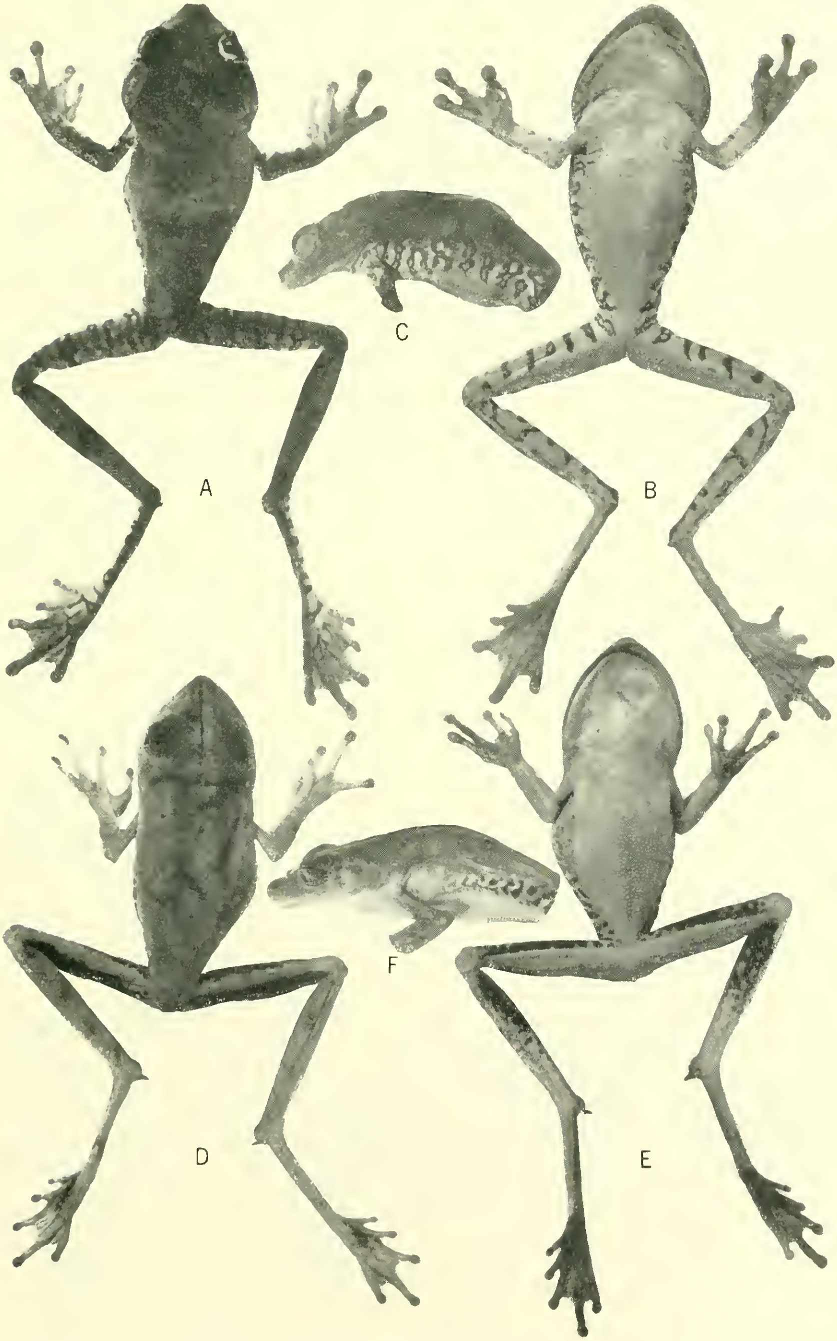


PLATE 27.—A–C: *Hyla geographica geographica*, MLS 64 (× 0.8). D–F: *H. calcarata*, CNHM 81333 (× 0.9).

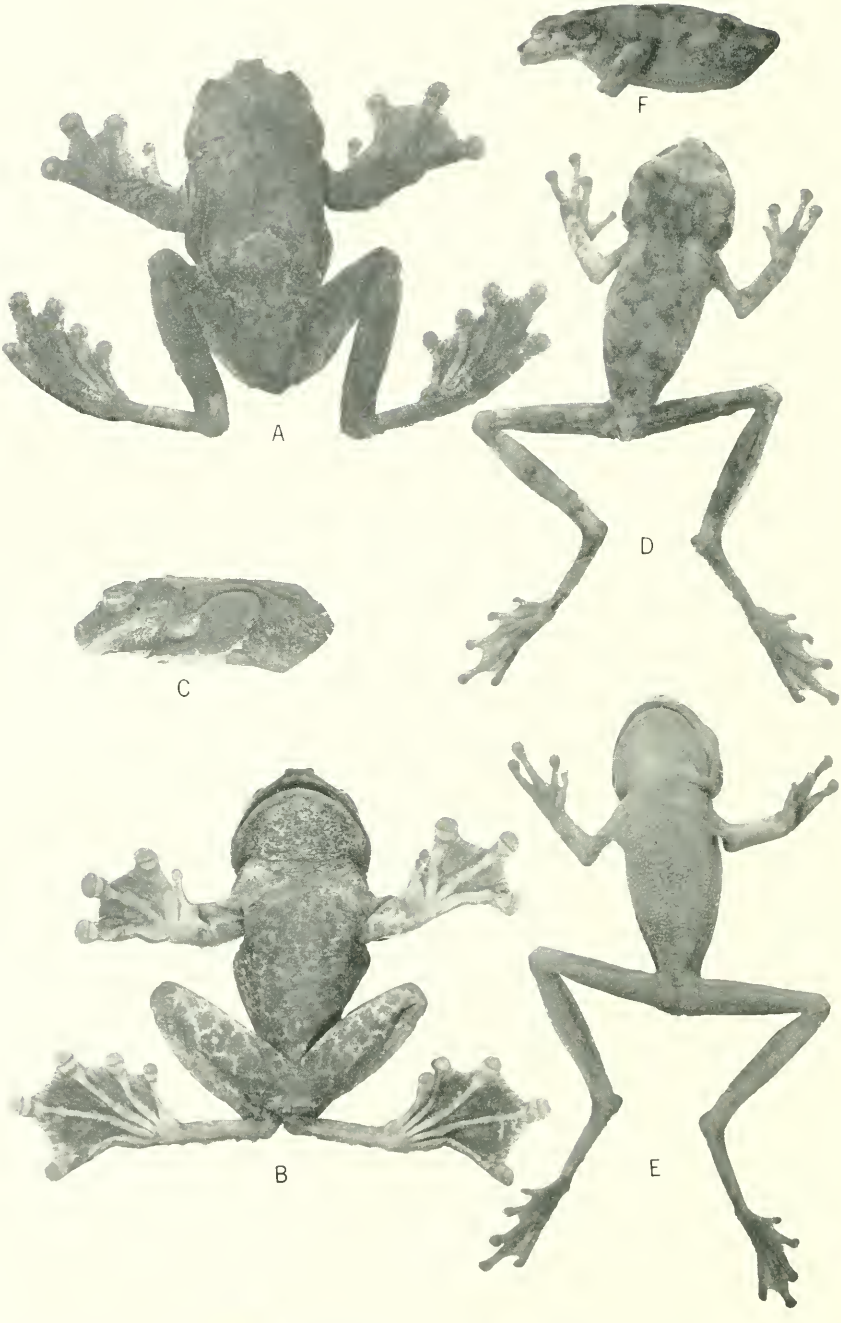


Plate 28.—A–C: *Hyla phantasmagoria*, holotype, MLS 267 (× 0.8). D–F: *H. buckleyi*, CNHM 54765 (× 0.9).

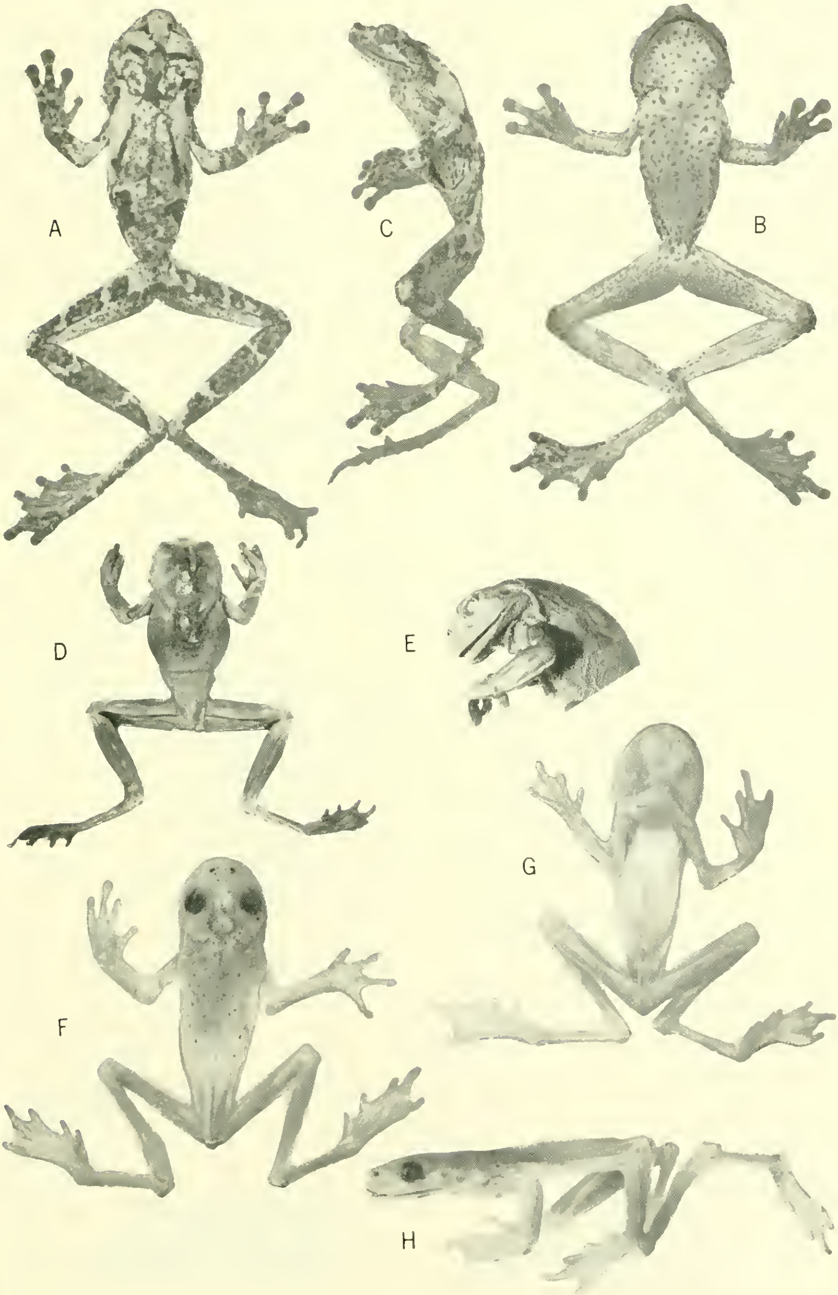


PLATE 29.—A–C: *Hyla cabrerai*, holotype, USNM 152759 (× 0.7). D,E: *H. albopunctulata*, BM 1908.5.29.68, type of *H. palmeri* (× 0.6). F–H: *H. albomarginata*, CJG 2354 (same size).

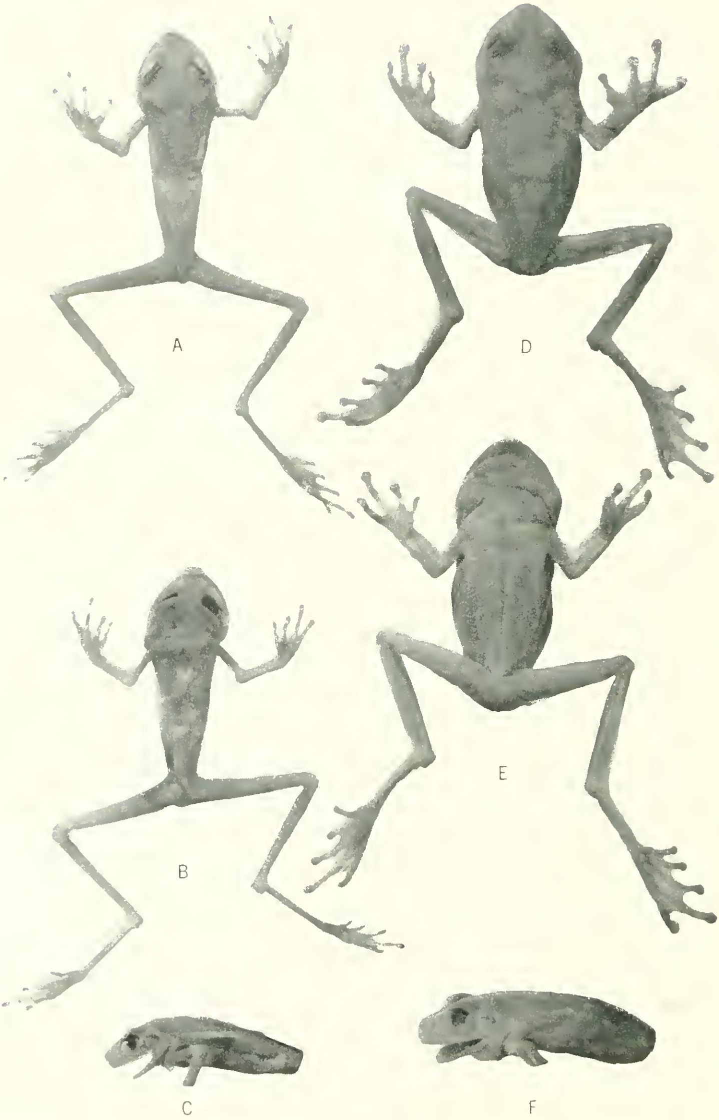


PLATE 30.—A–C: *Hyla rubeola,* holotype, USNM 152751 (same size). D–F: *H. rhodoporus,* CNHM 81786 (same size).

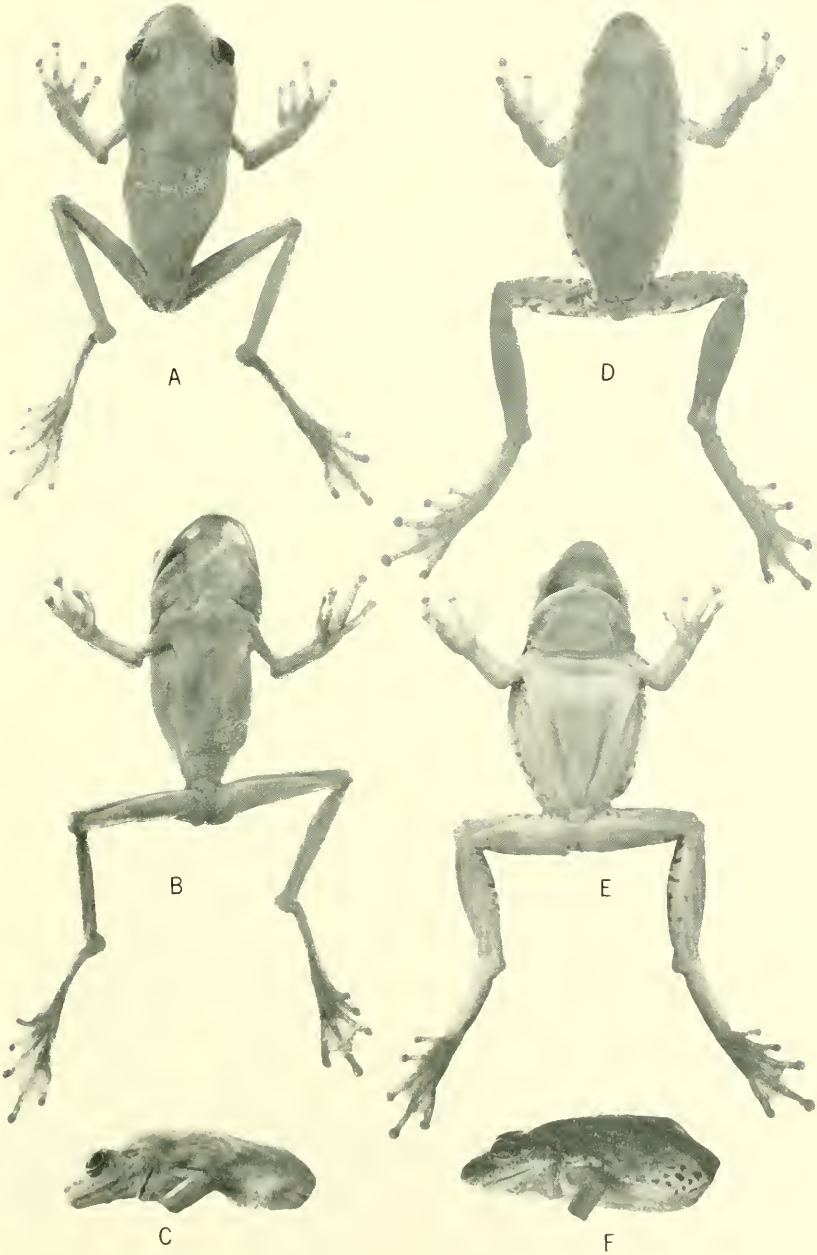


PLATE 31.—A–C: *Hyla granosa*, USNM 152756 (× 1.2). D–F: *H. rubra*, CNHM 81818 (× 1.2).

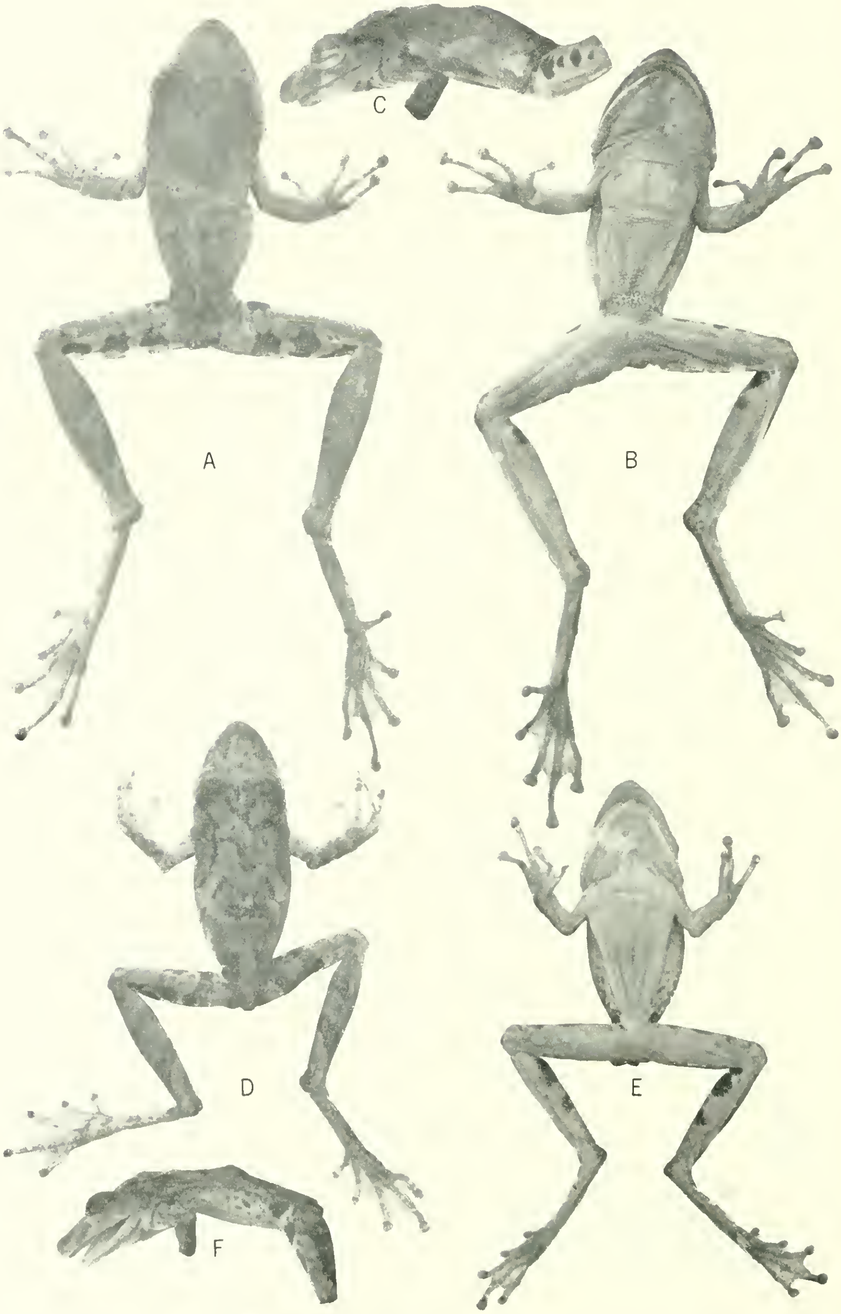


Plate 32.—a–c: *Hyla foliamorta*, USNM 127865 (× 1.8). d–f: *H. boulengeri*, CNHM 81854 (× 1.1).

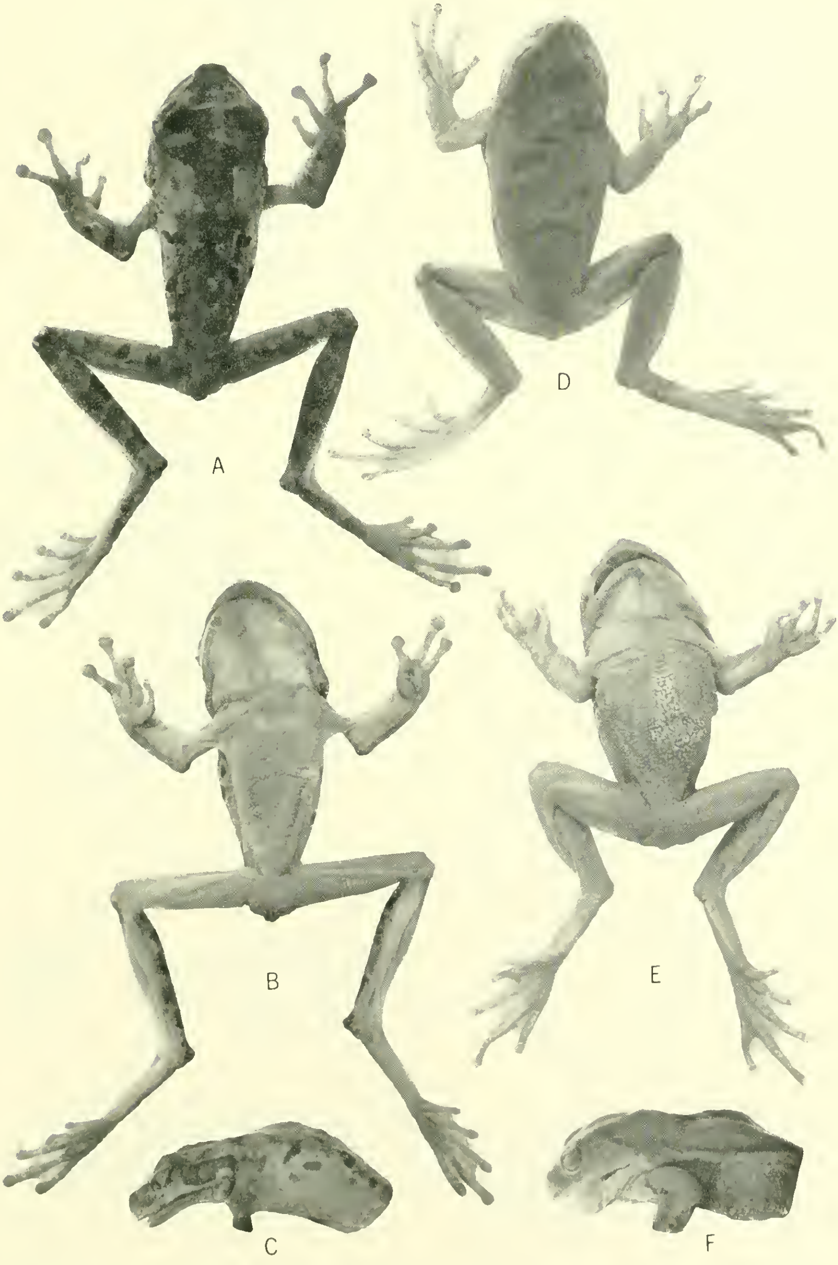


PLATE 33.—A–C: *Hyla palpebrogranulata,* USNM 152757 (× 1.2). D–F: *H. labialis labialis,* USNM 95155 (× 1.1).

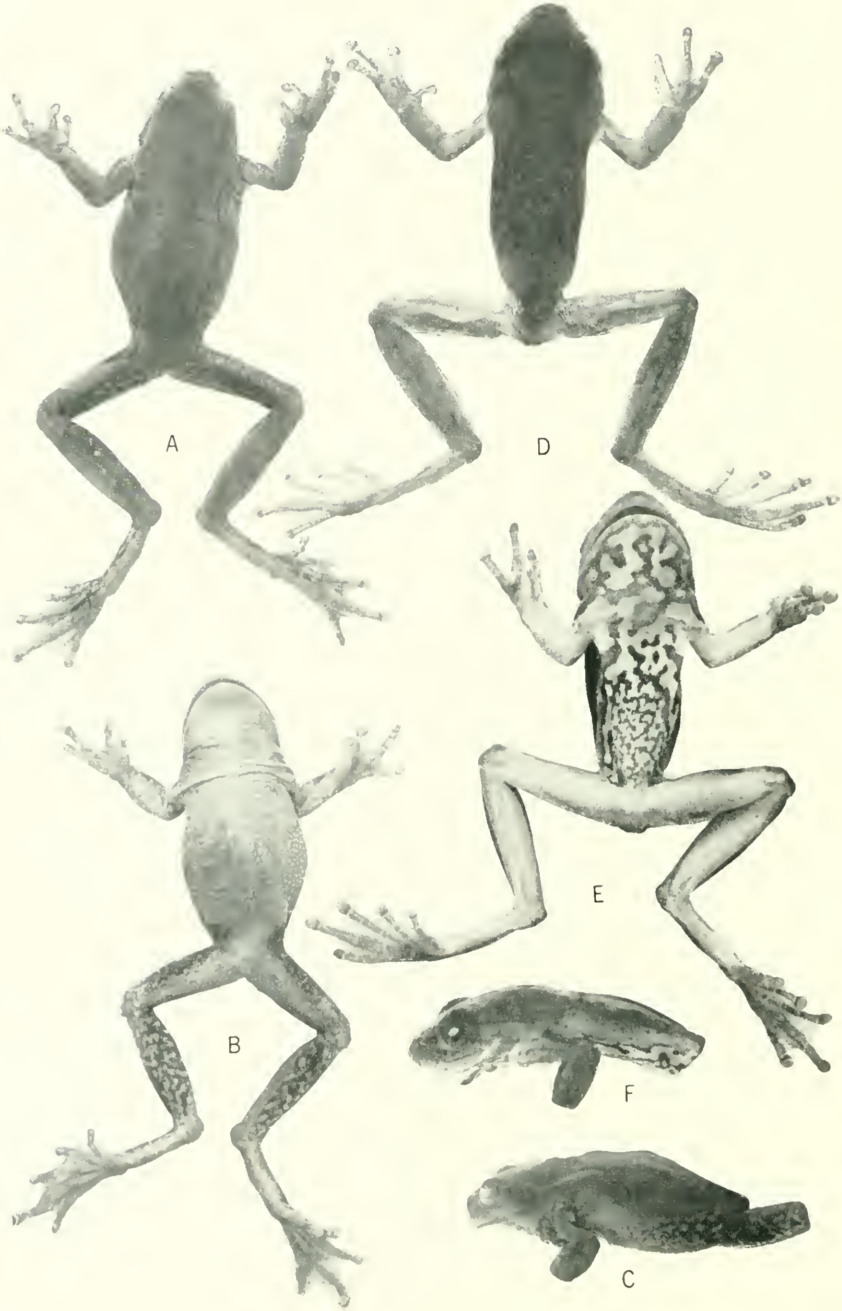


PLATE 34.—A–C: *Hyla labialis platydactyla*, MZUM 92162 (same size). D–F: *H. variabilis*, USNM 151983 (× 1.5).

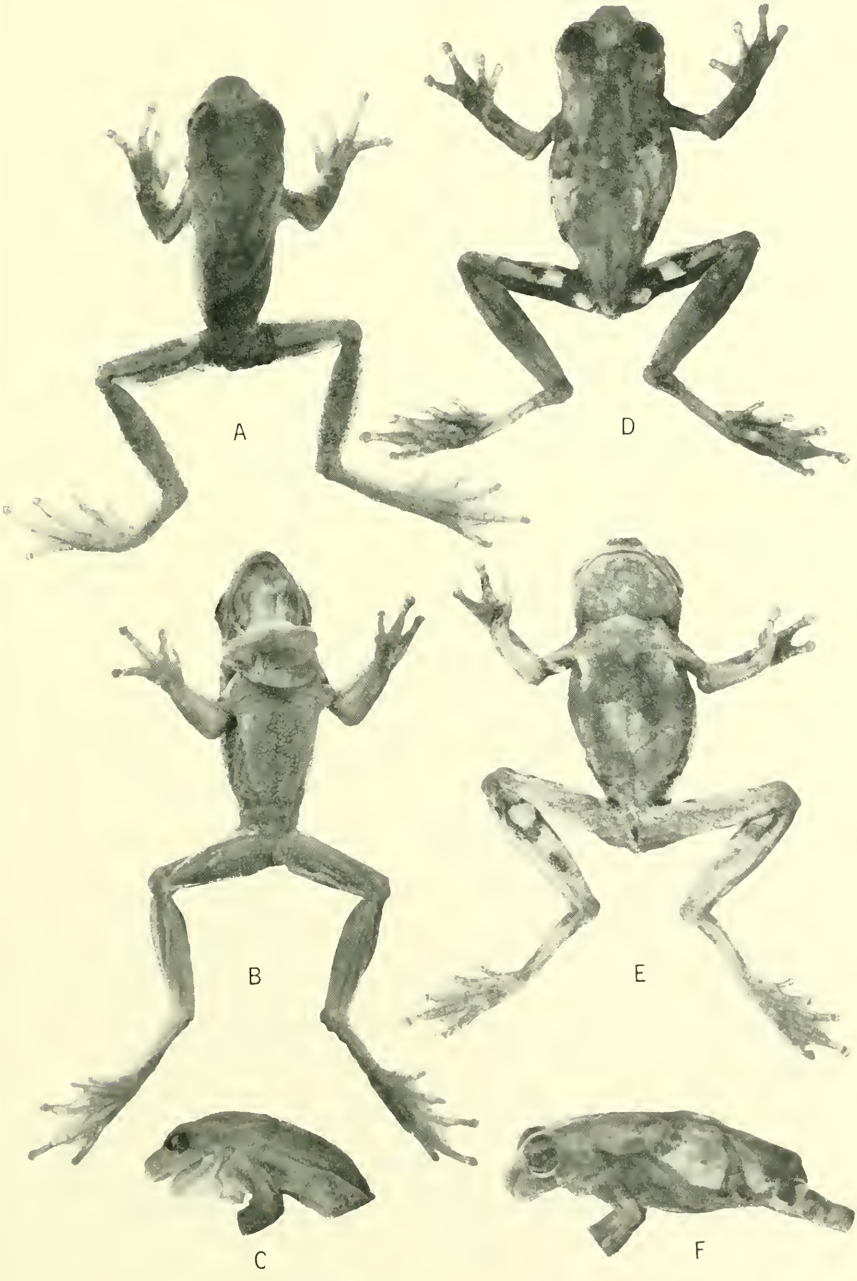


Plate 35.—a–c: *Hyla columbiana*, MLS 192b (× 1.5). d–f: *H. parviceps*, MLS 54 (× 2).

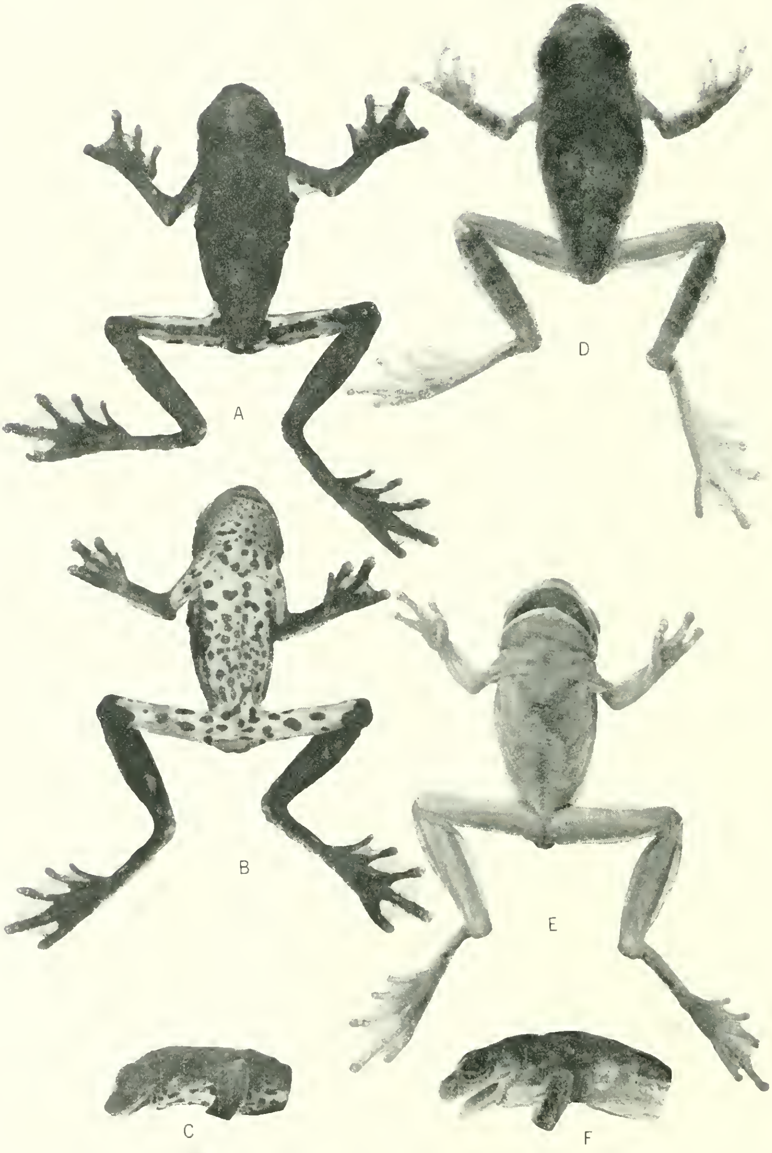


Plate 36.—a–c: *Hyla marmorata*, MLS 55 (× 1.3). d–f: *H. minuta*, CNHM 81764 (× 2.).

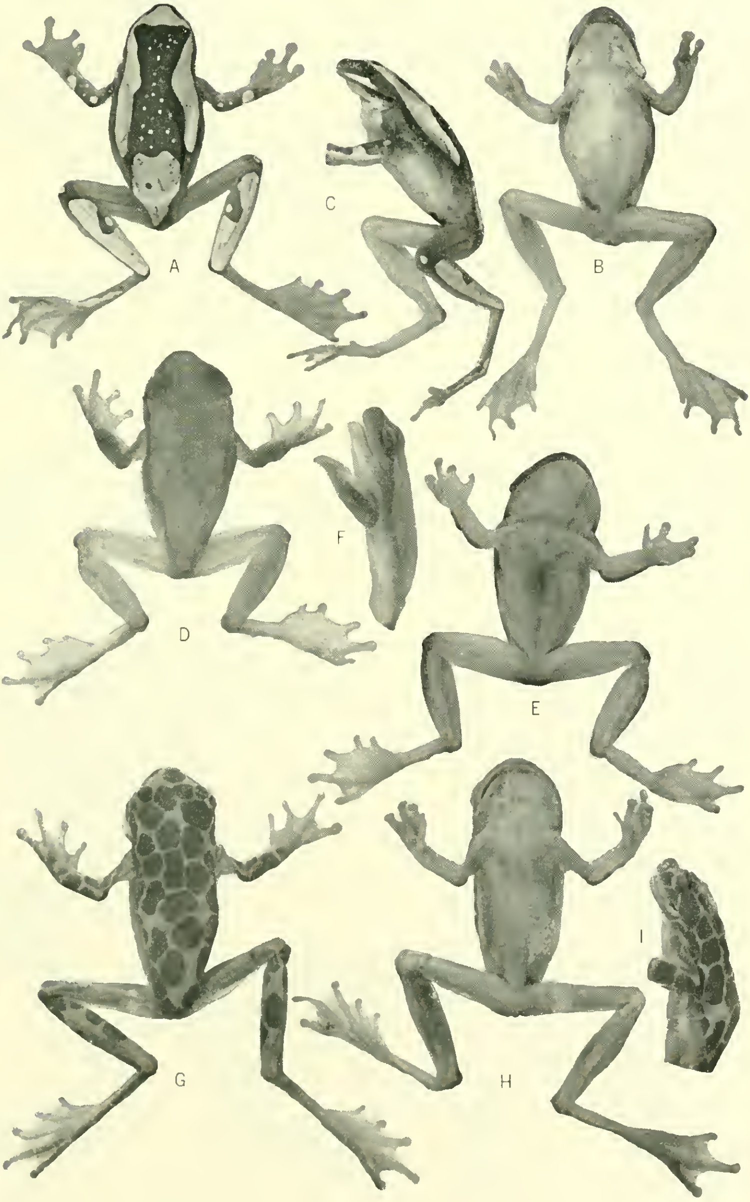
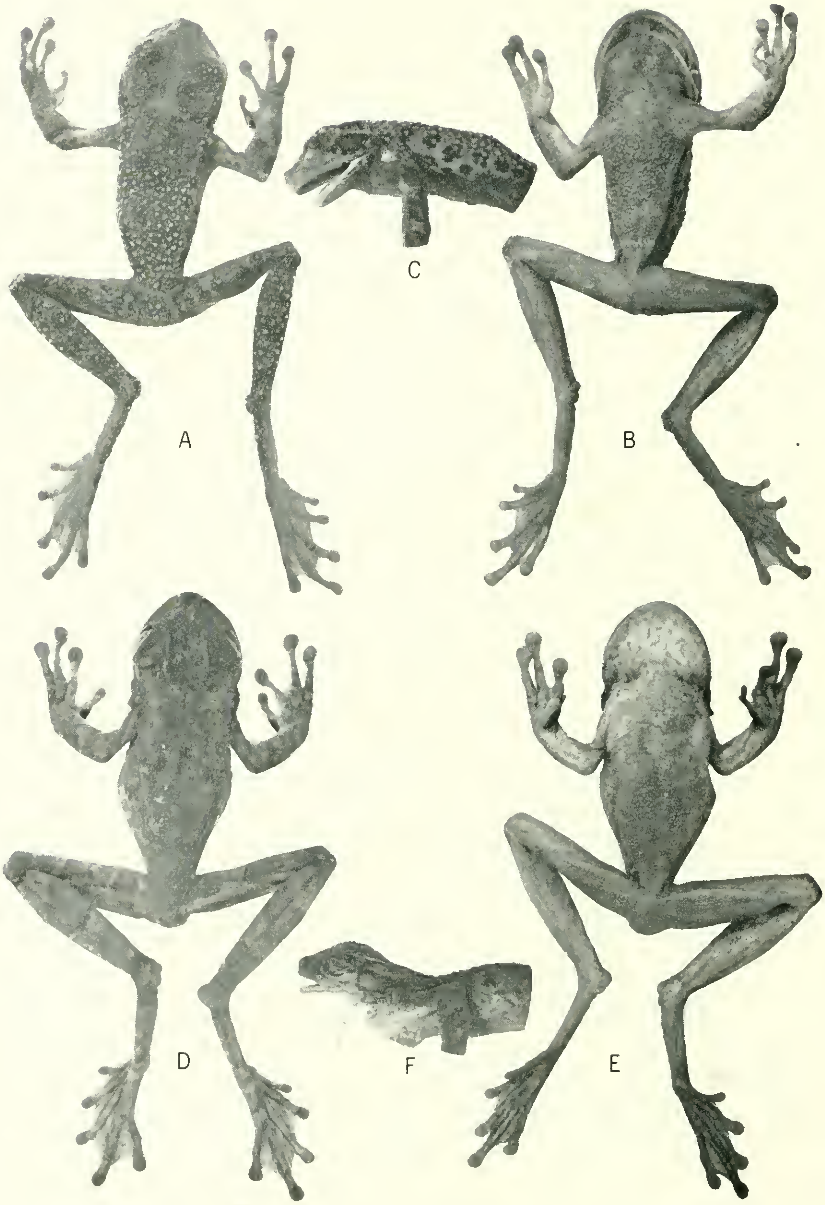


Plate 37.—a–c: *Hyla ebraccata,* CJG 2369 (same size). d–f: *H. membranacea* UF 8523 (× 1.5). g–i: *H. reticulata,* MLS 25 (× 1.4).



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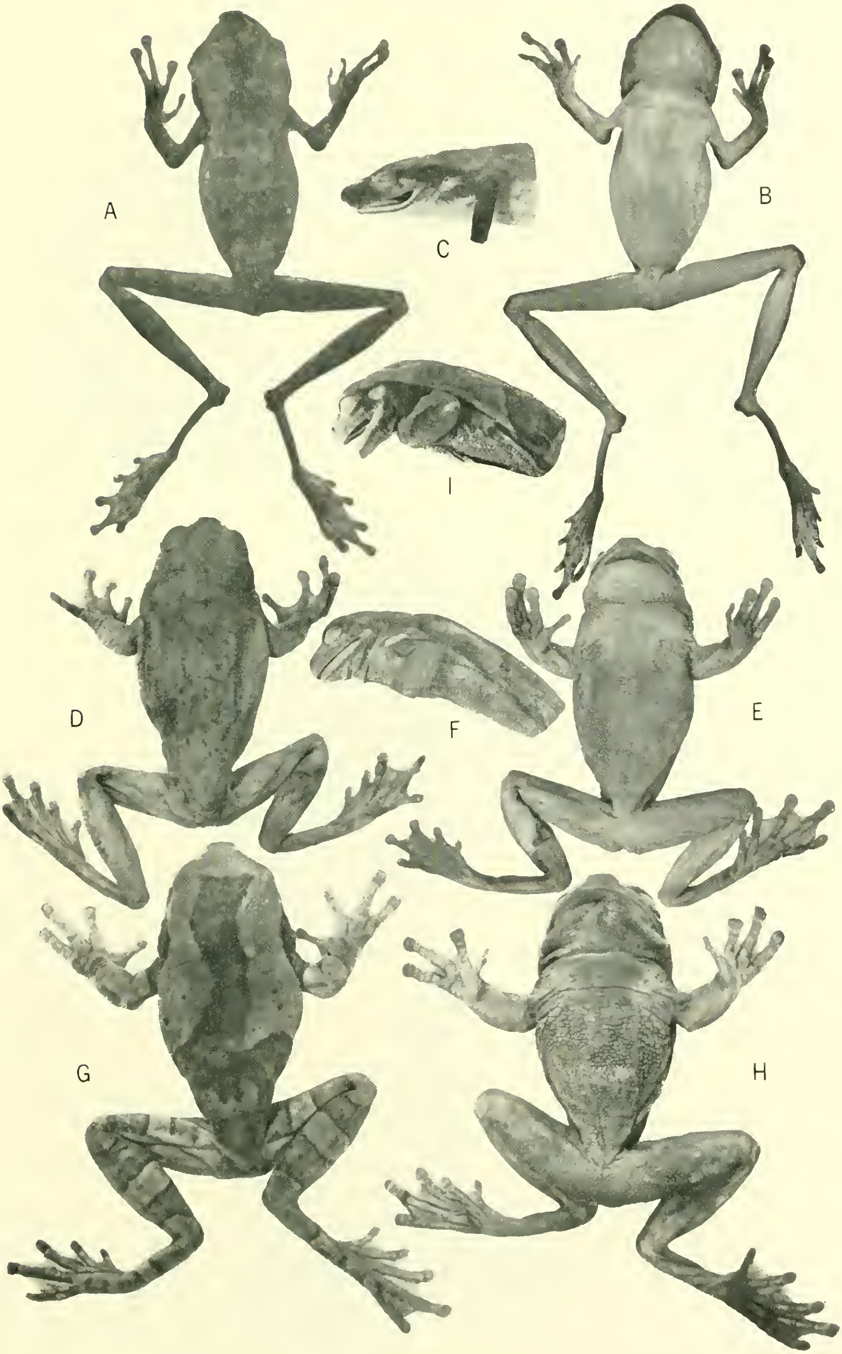

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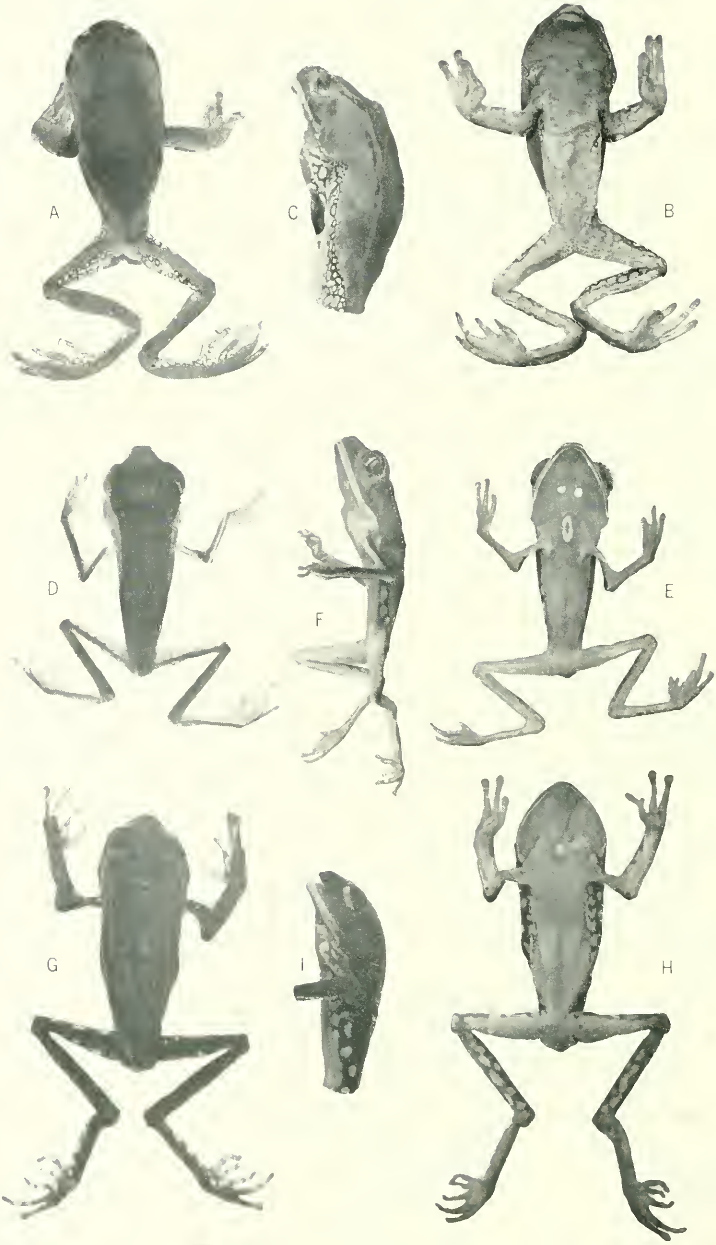

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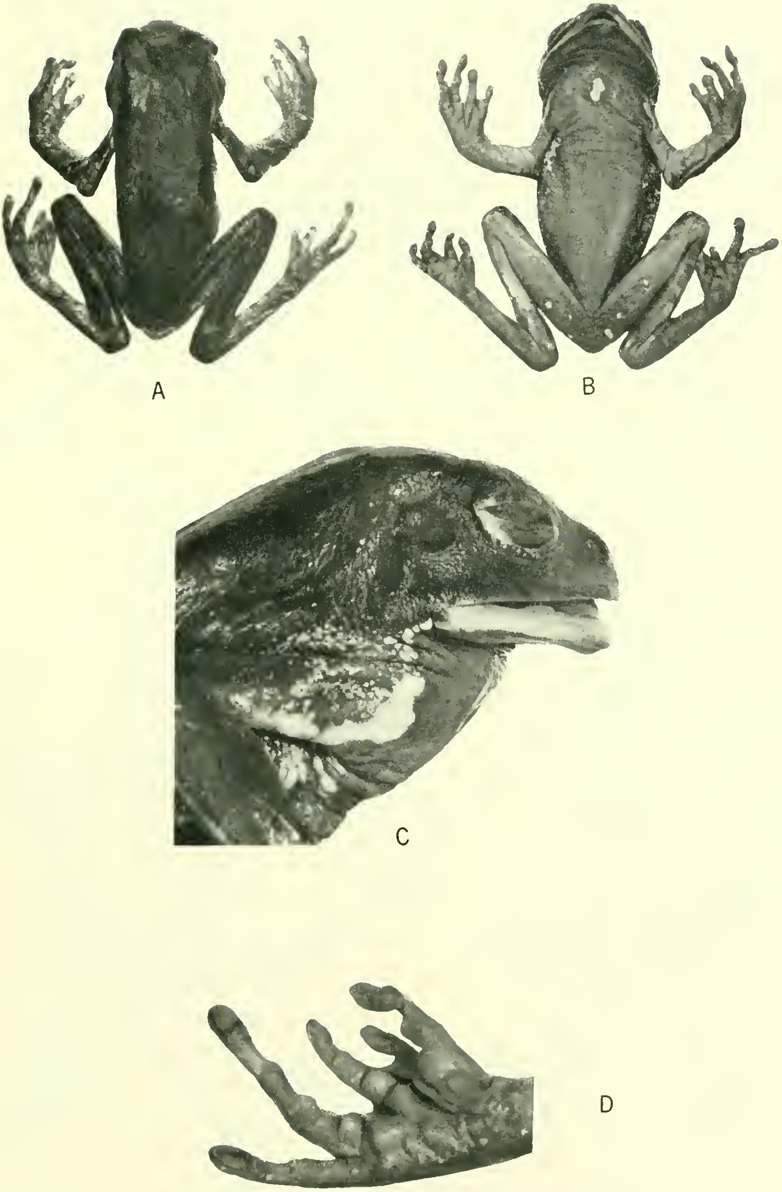

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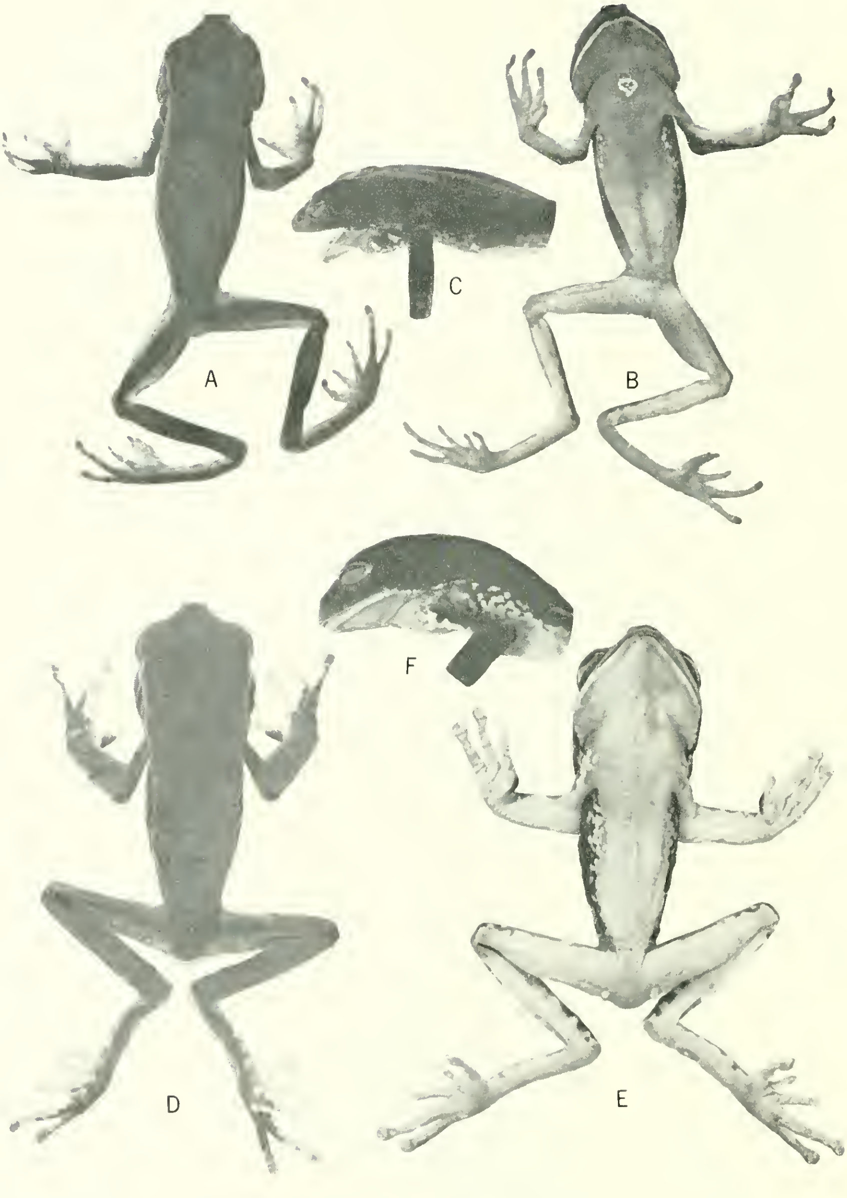

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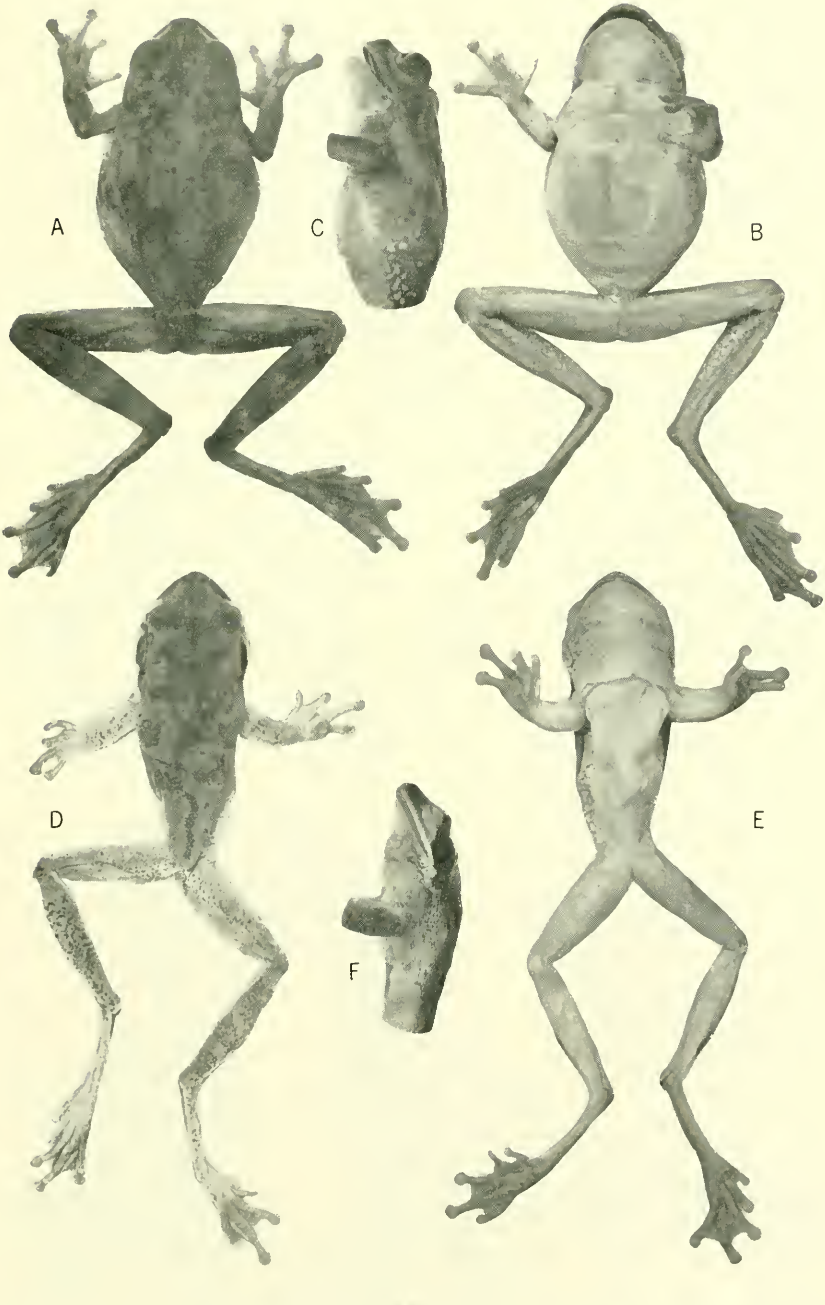

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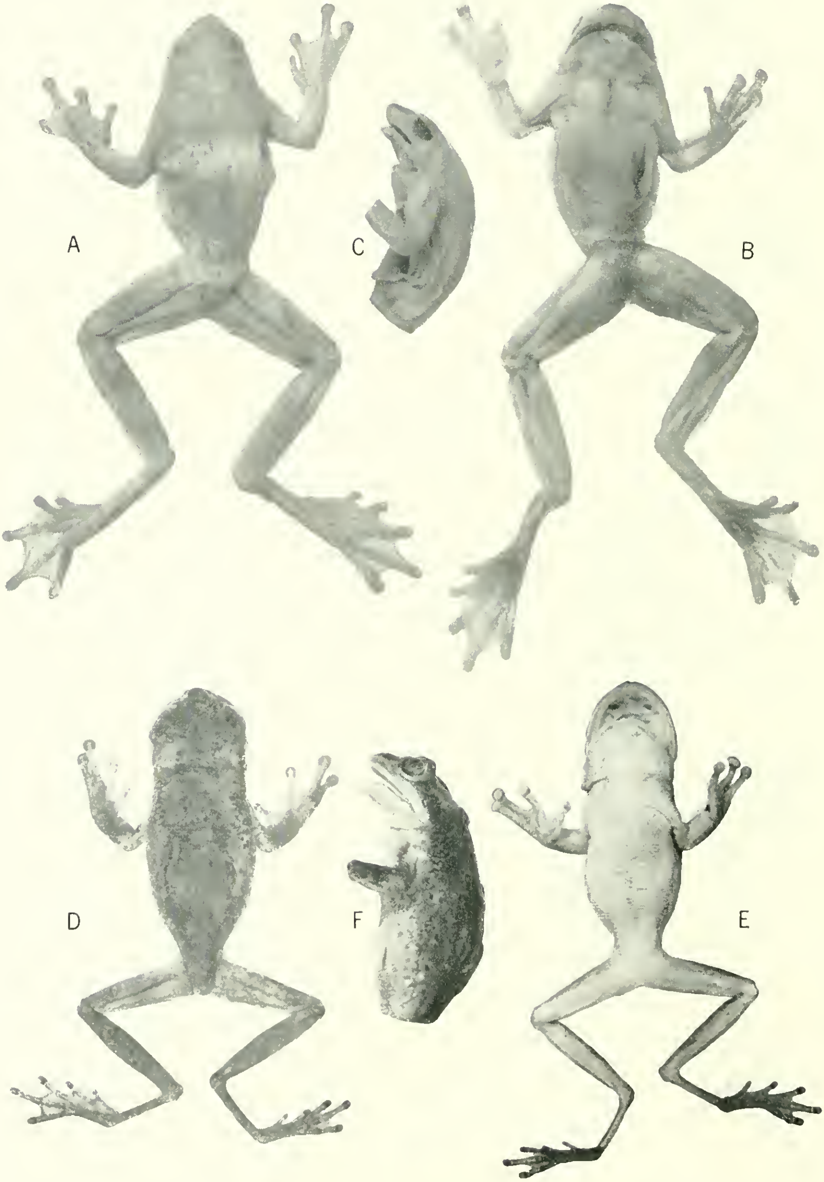

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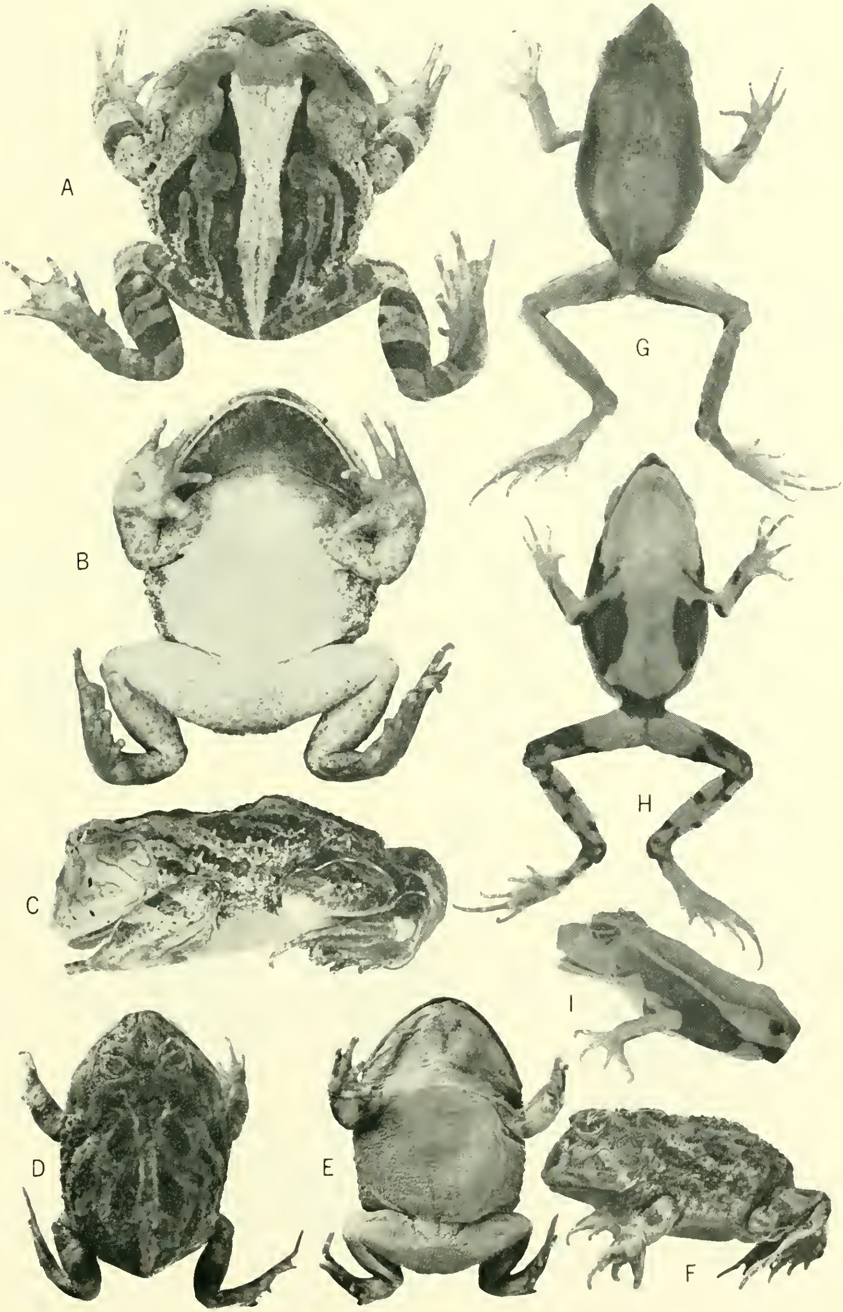

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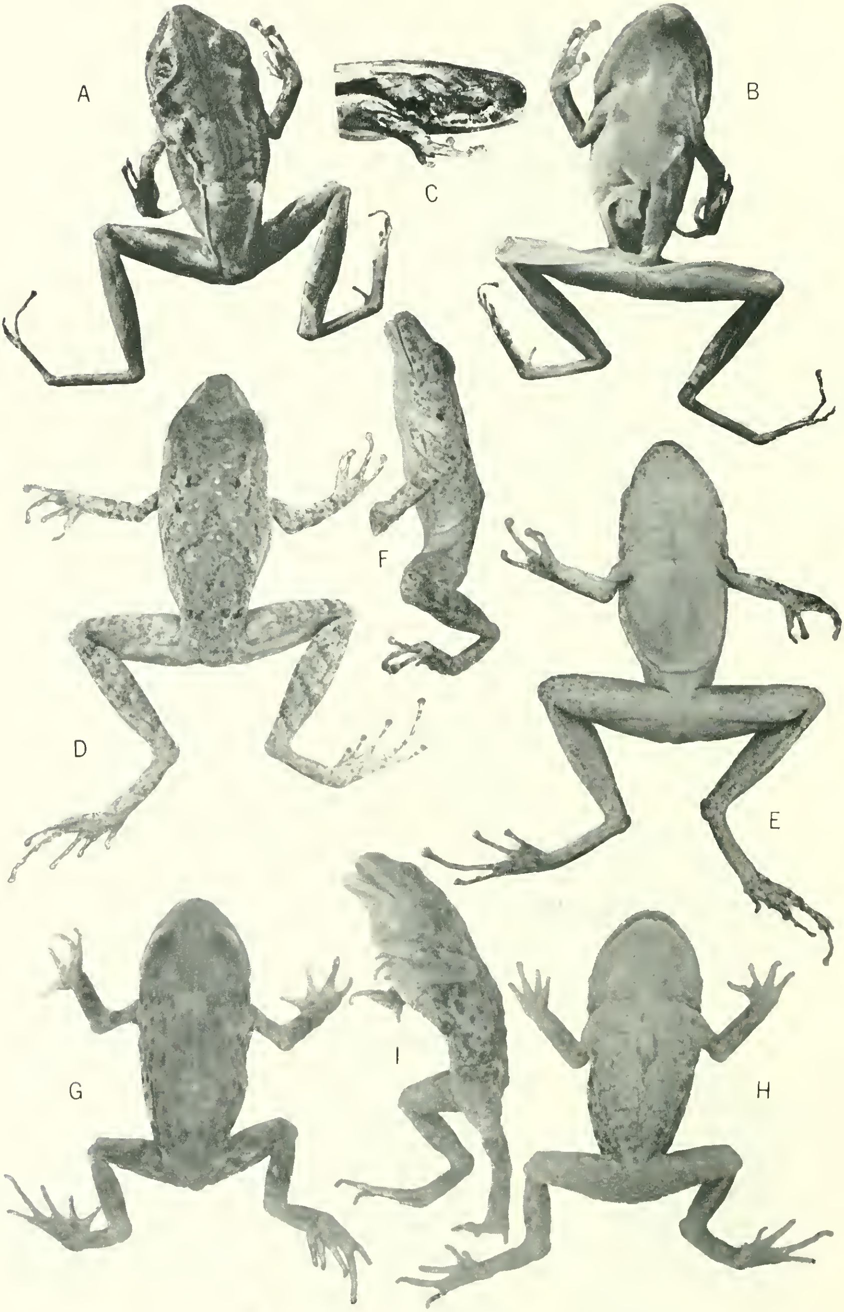


PLATE 46.—A–C: *Eleutherodaclyust taeniatus*, holotype, BM 1909.10.30.41 (× 1.4). D–F: *E. terraebolivaris*, USNM 147011 (× 0.9). G–I: *E. nicefori*, holotype, USNM 147012 (× 1.8).

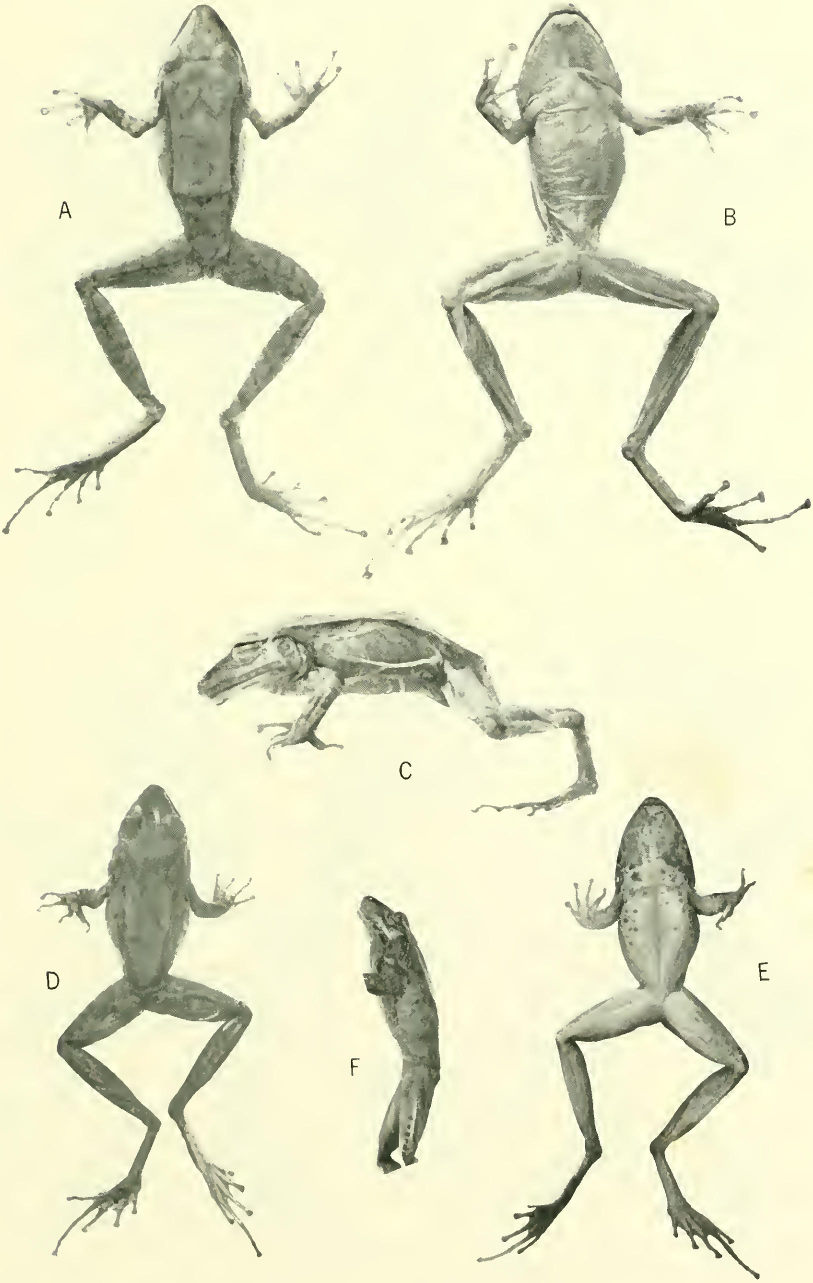


Plate 47.—a–c: *Eleutherodactylus brederi*, ANSP 24392 (× 0.9). d–f: *E. longirostris*, USNM 124265 (× 0.5).

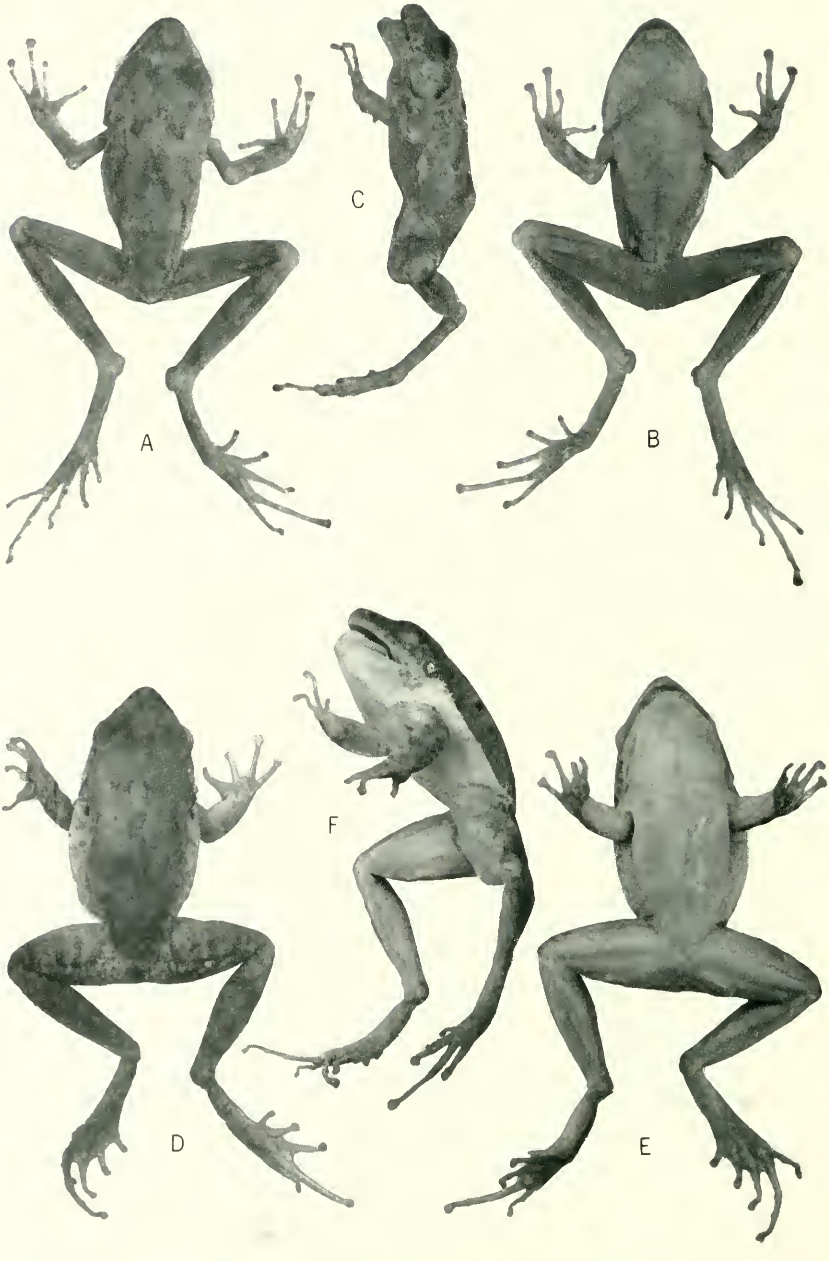
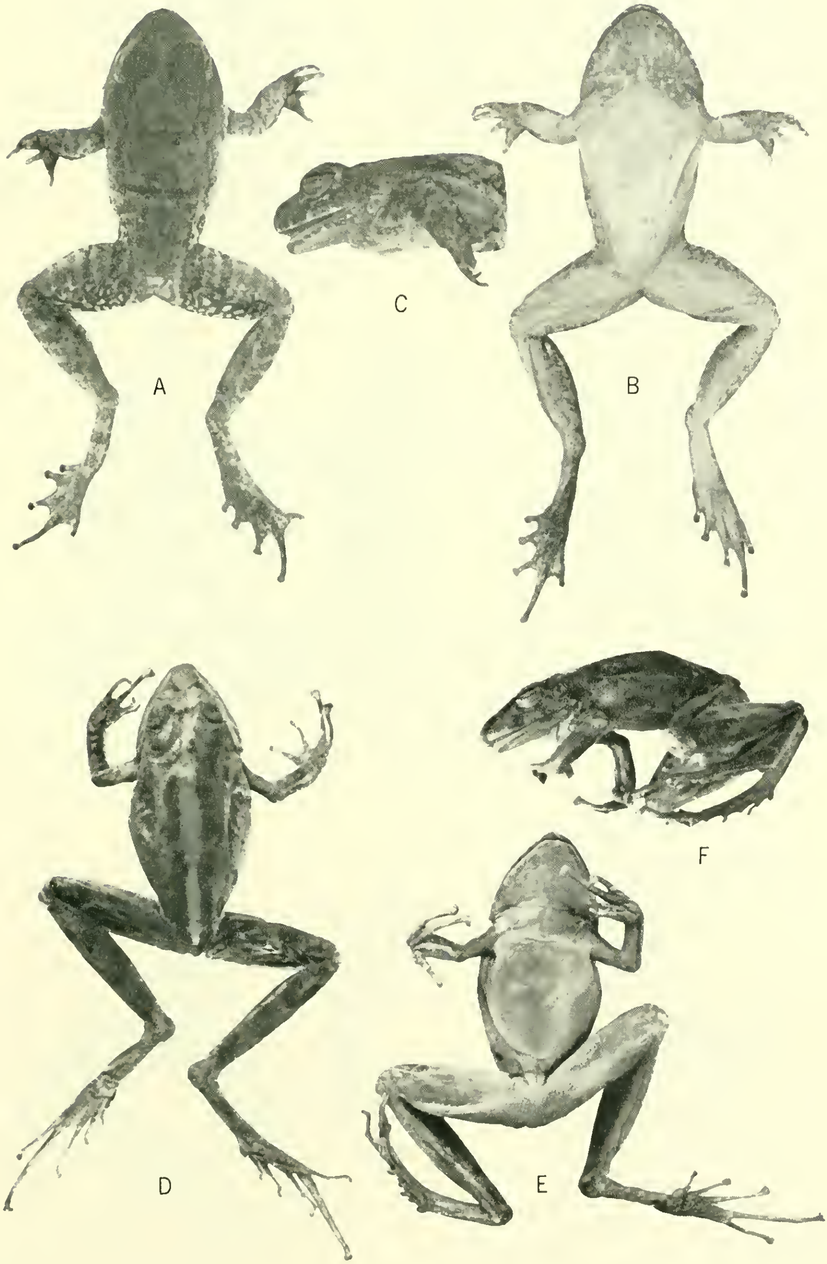


Plate 48.—A–C: *Eleutherodactylus lymani,* MZUM 73423 (× 1.1). D–F: *E. raniformis,* USNM 124235 (same size).



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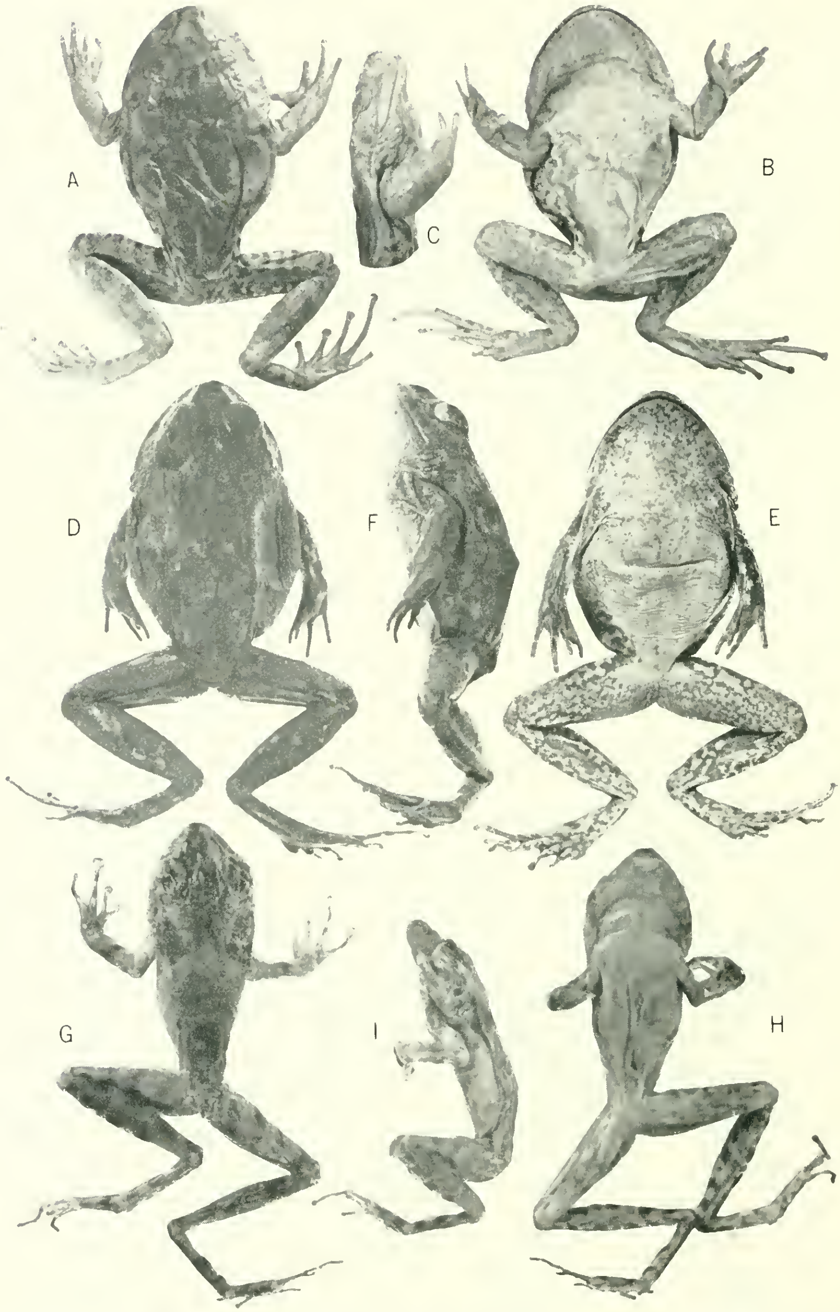

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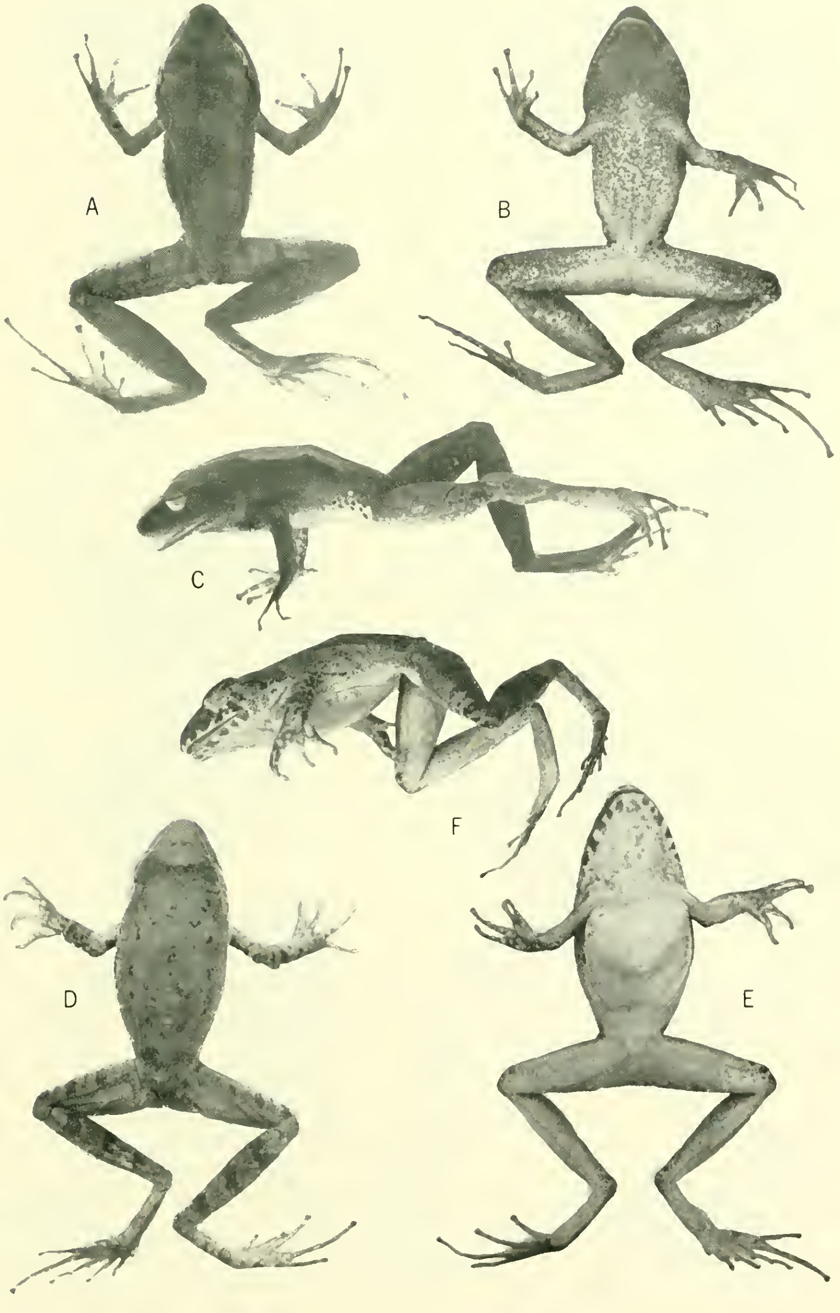

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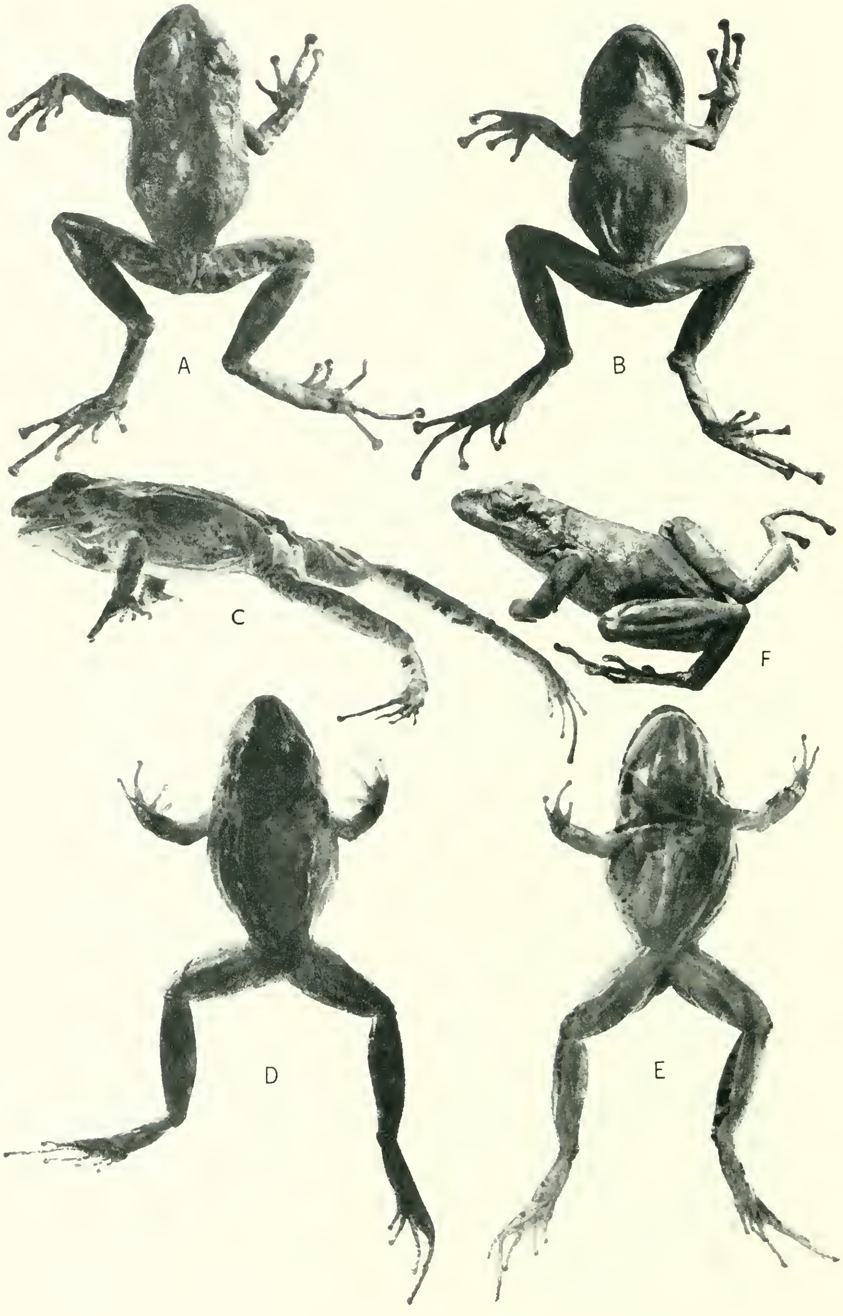

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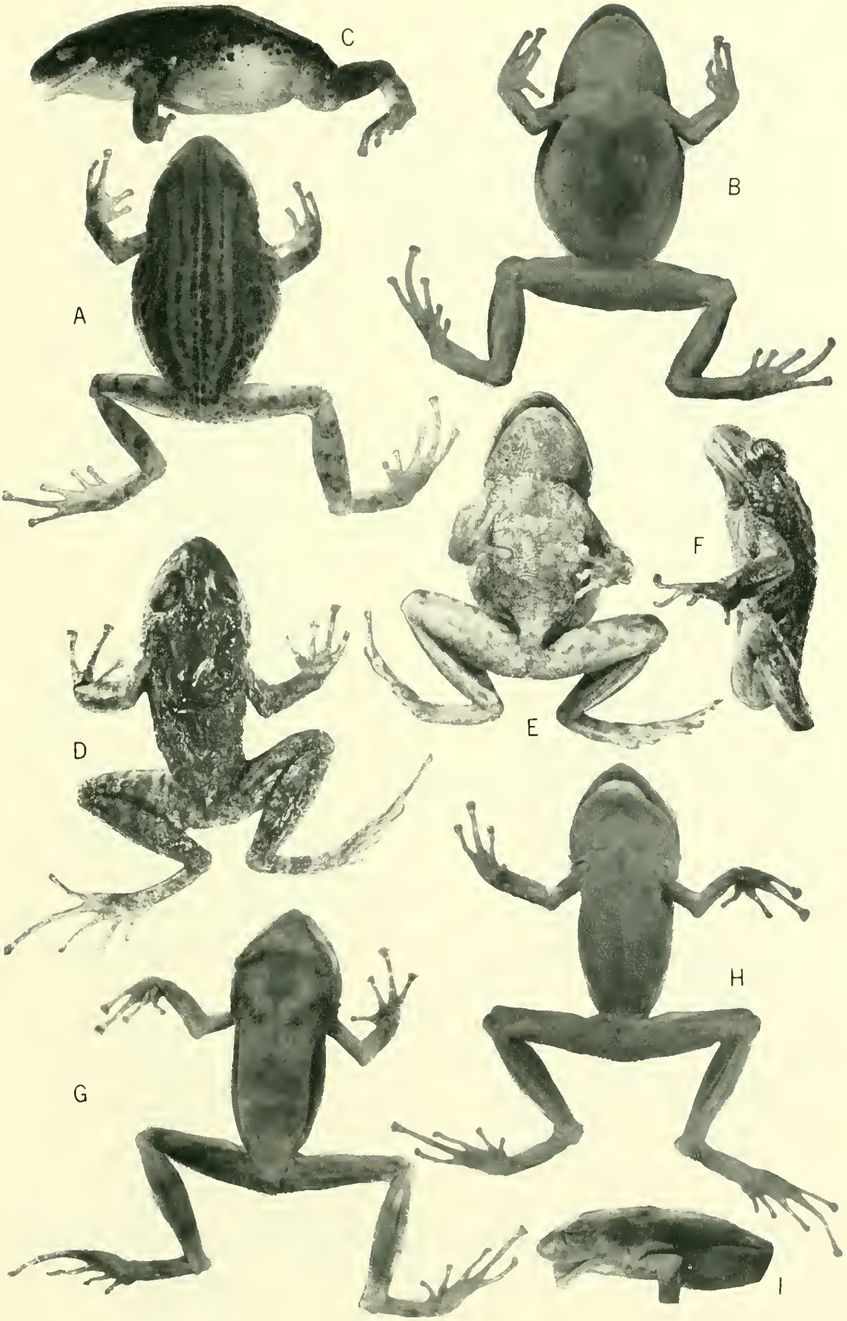

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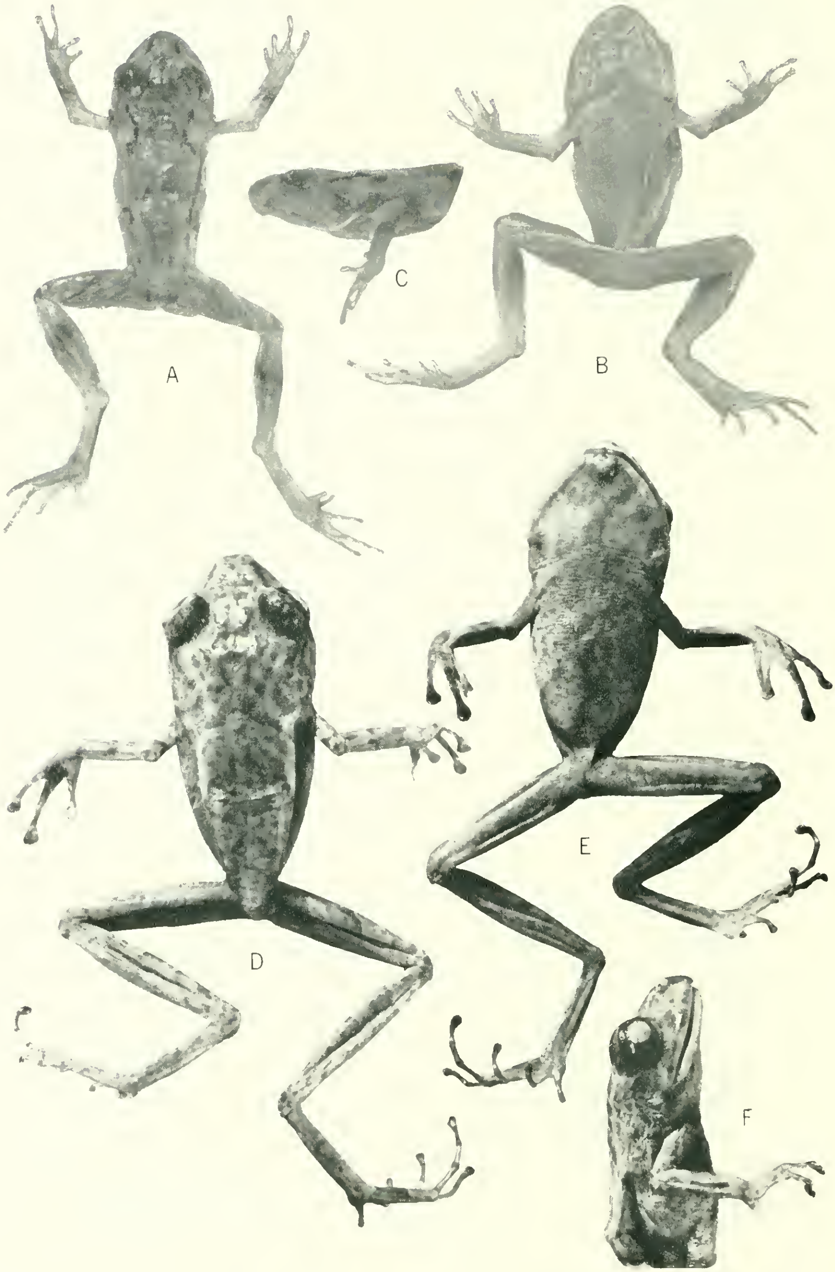


Plate 54.—a–c: *Eleutherodactylus frater*, holotype, ZIMUG 67/235 (× 1.7). d–f: *E. palmeri*, cotype, BM 1910.7.11.64 (× 2.4).

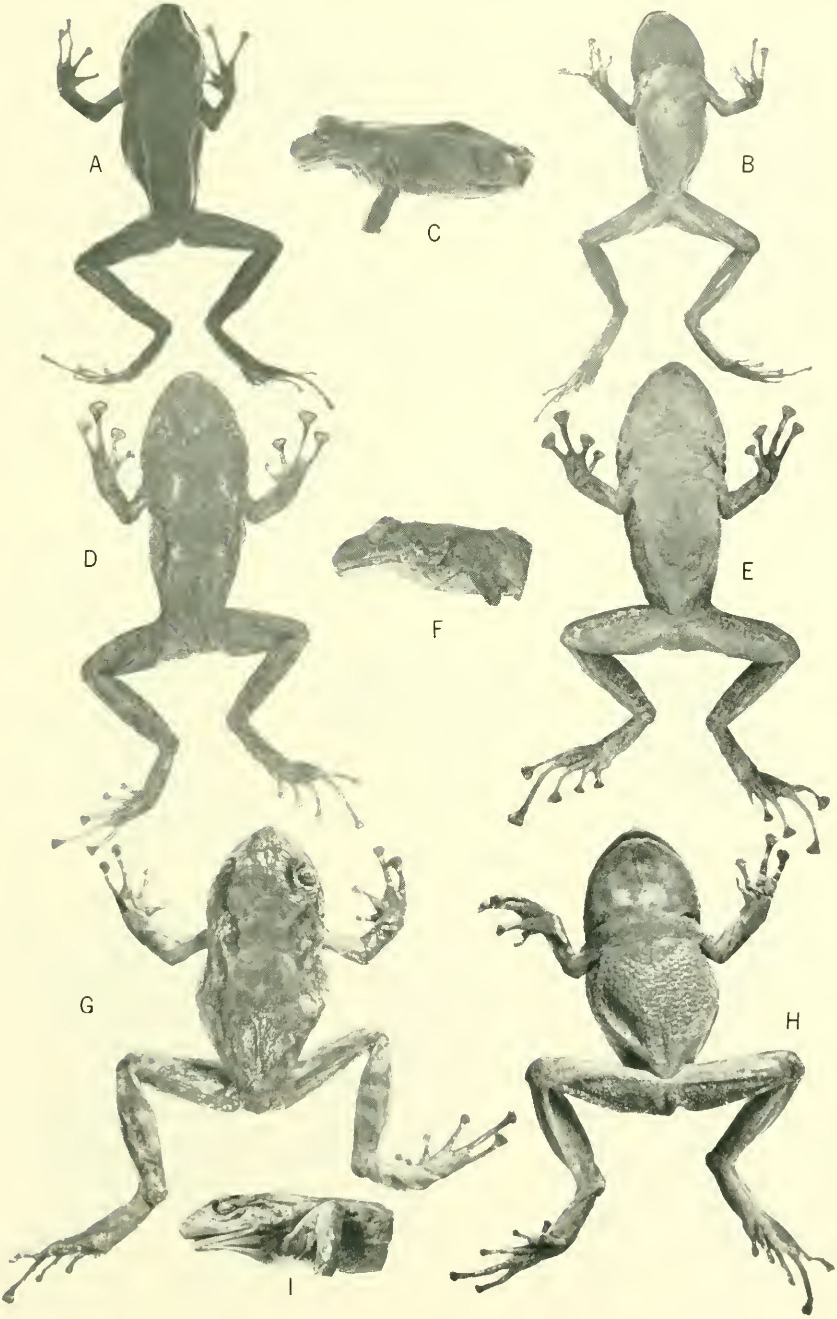
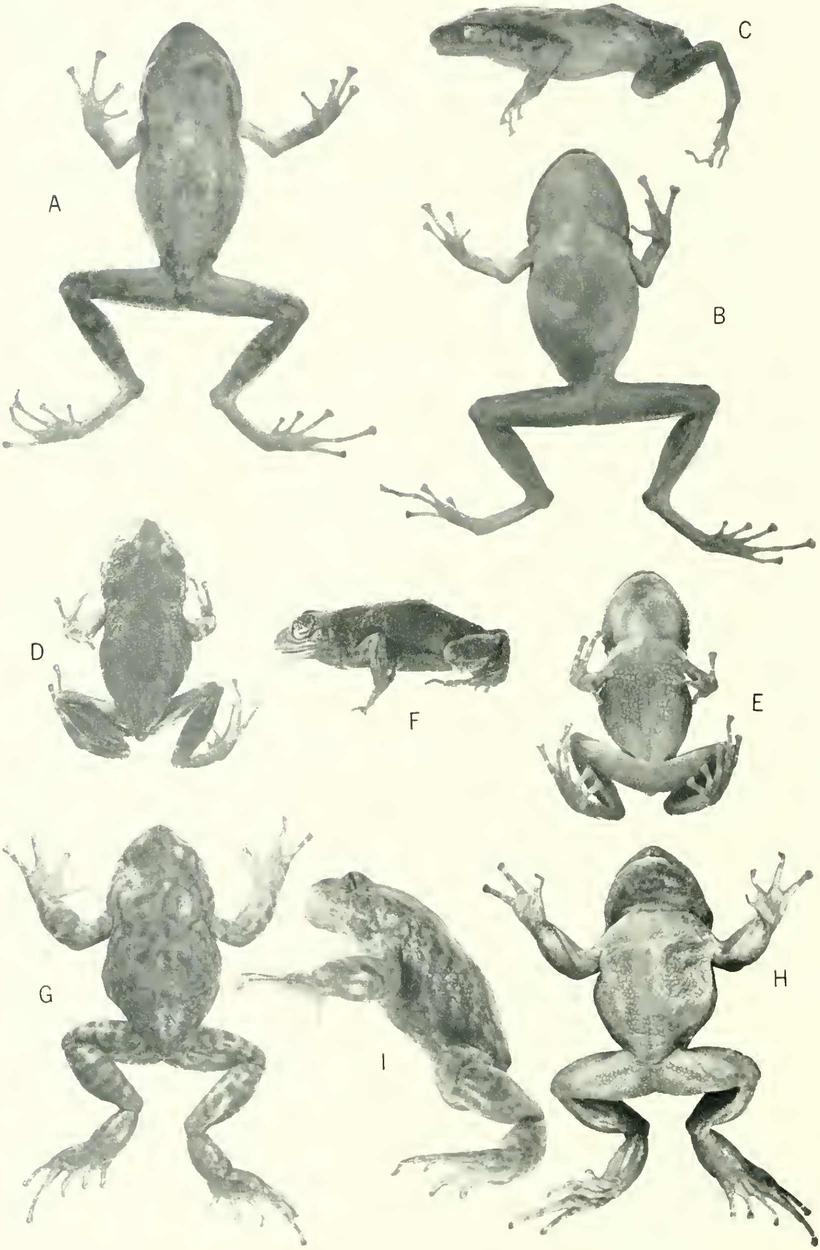


PLATE 55.—A–C: *Eleutherodactylus sanctae-martae*, MZUM 54541 (× 0.7). D–F: *E. latidiscus latidiscus*, cotype, BM 98.4.28.109 (× 0.7). G–I: *E. affinis*, cotype, ZIMUG 67/— (× 1.4).



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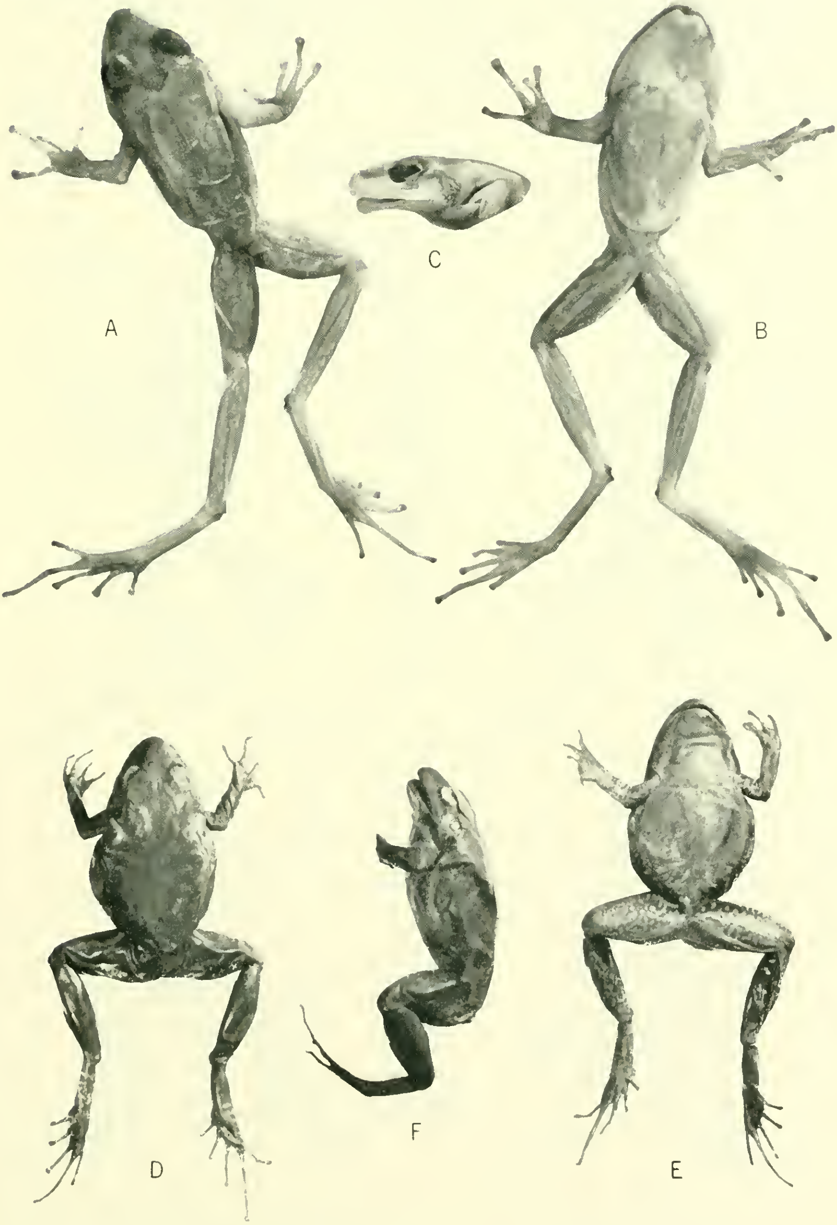
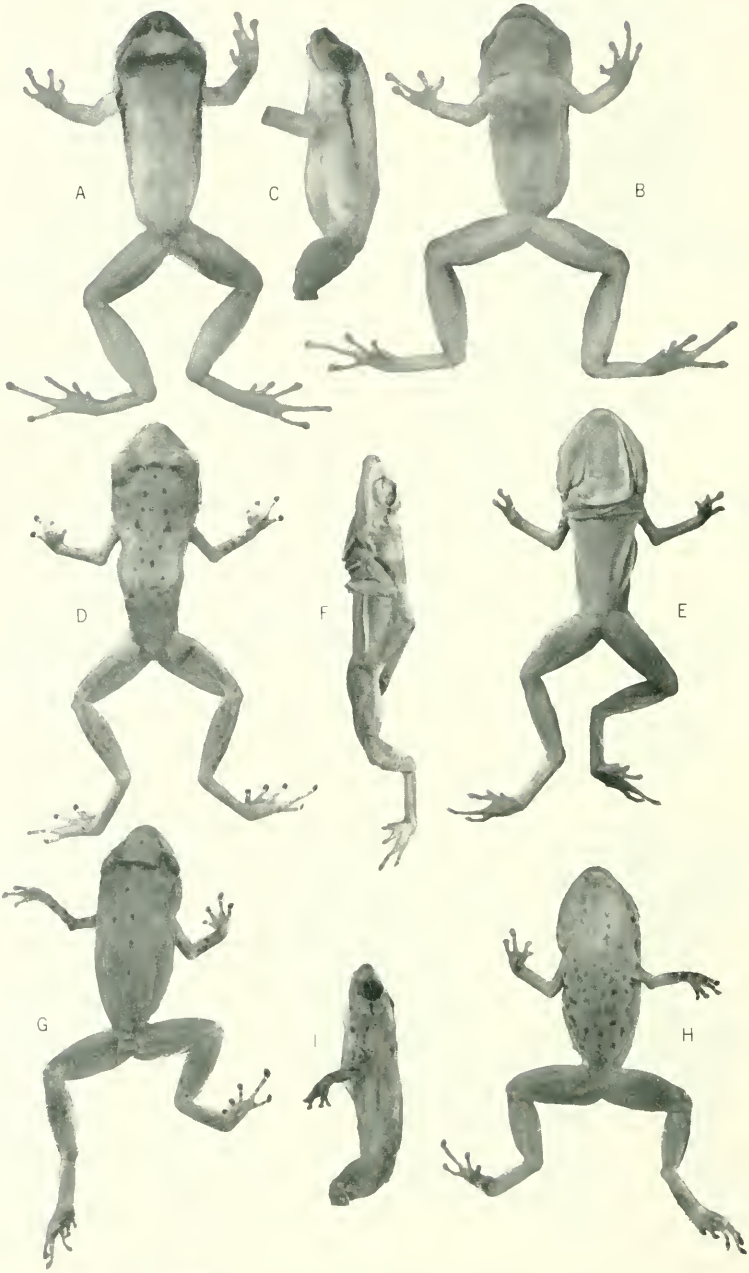


Plate 57.—a–c: *Eleutherodactylus delicatus*, MZUM 54573 (× 1.4). d–f: *E. insignitus*, paratype, MZUM 48402 (× 0.6).



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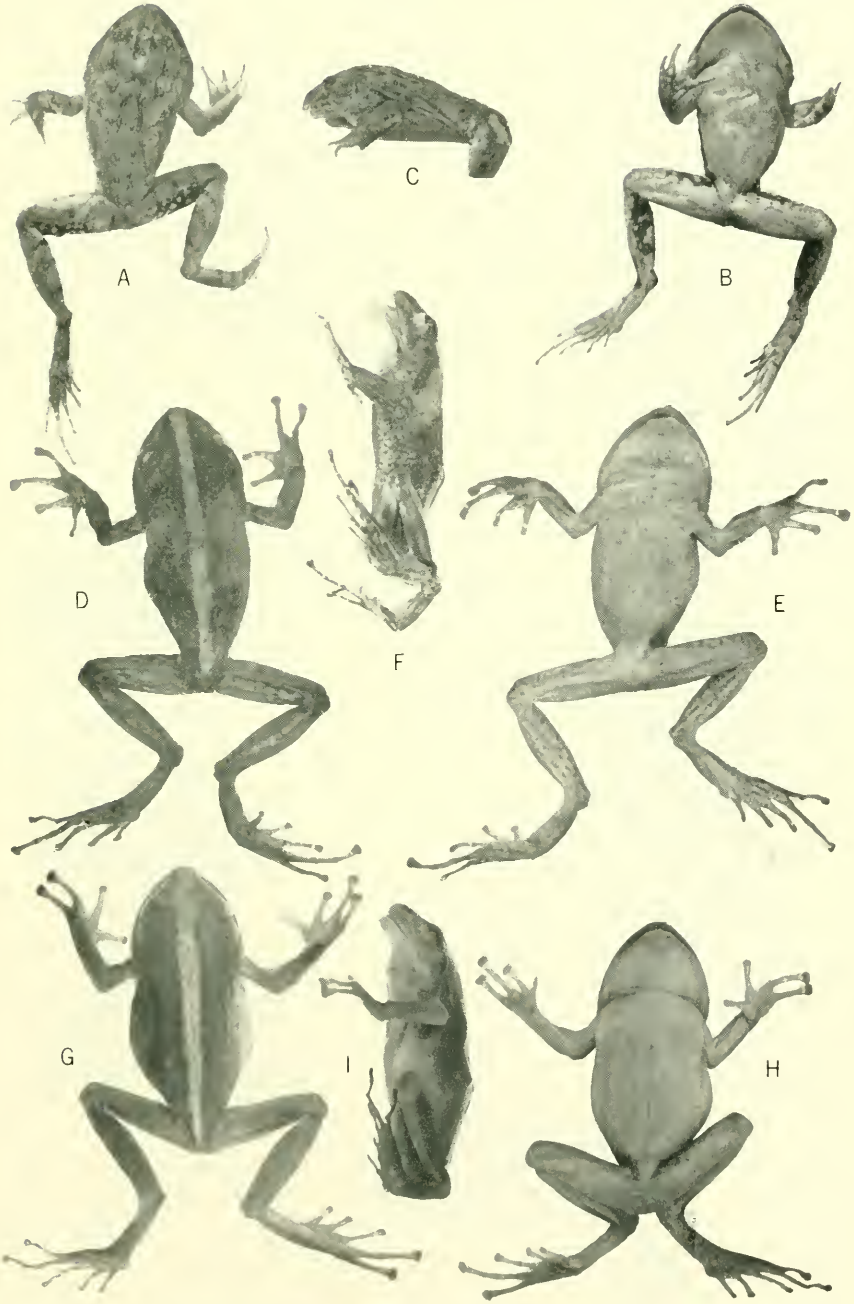

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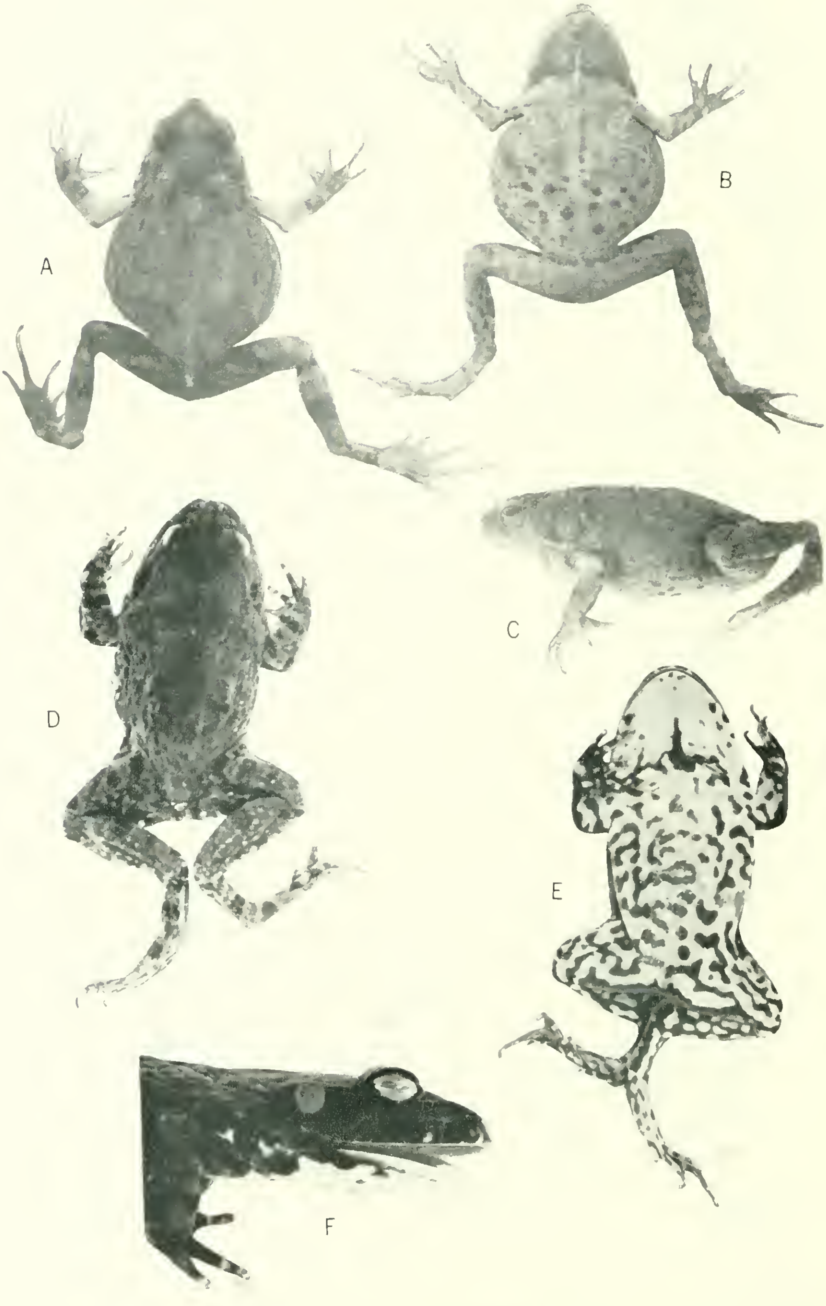

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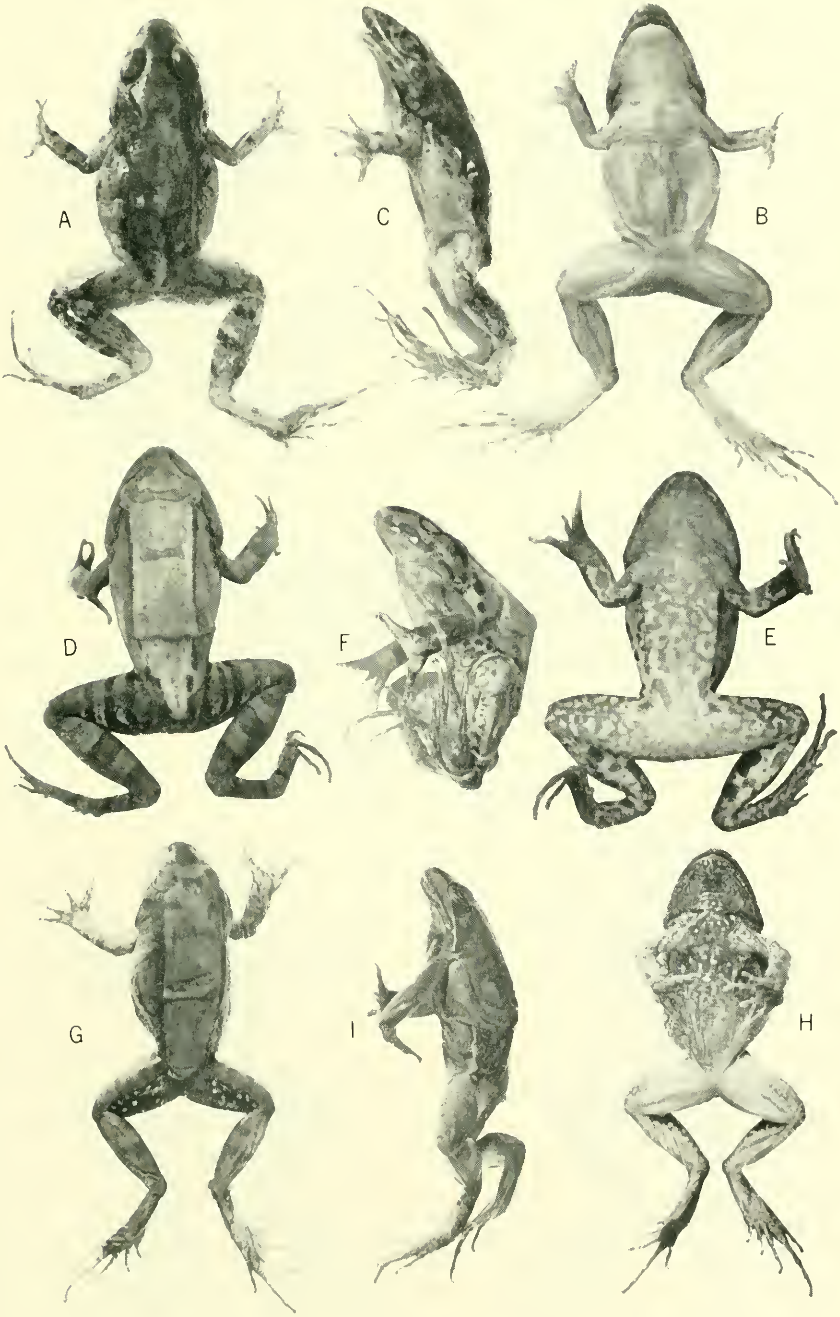

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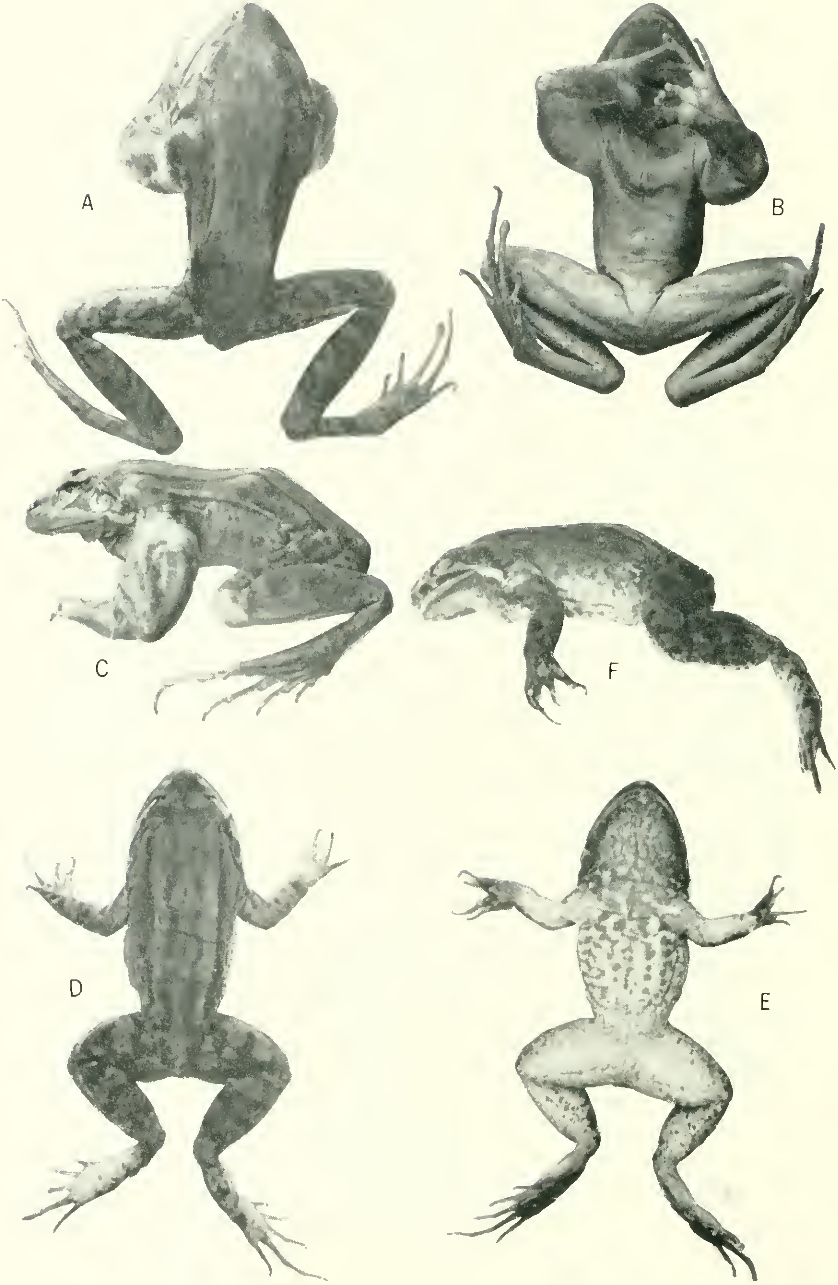

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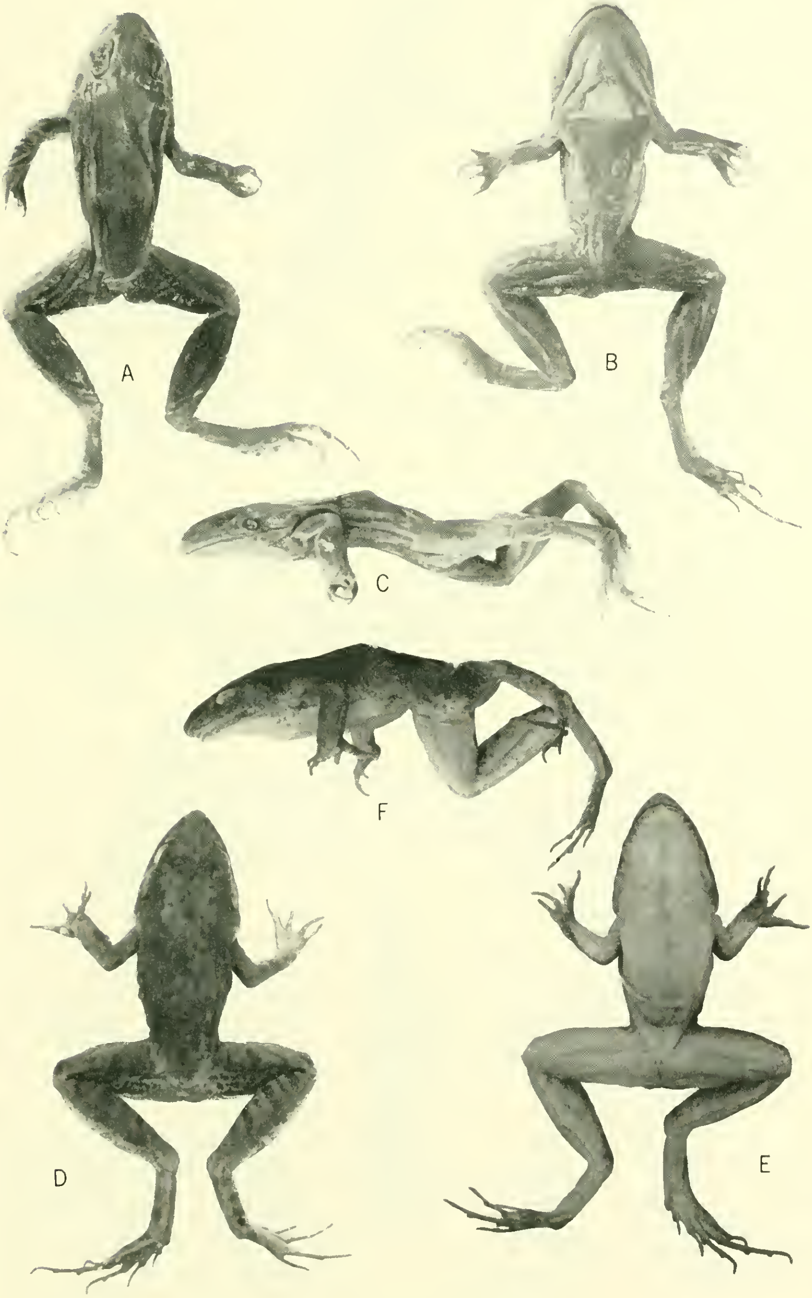

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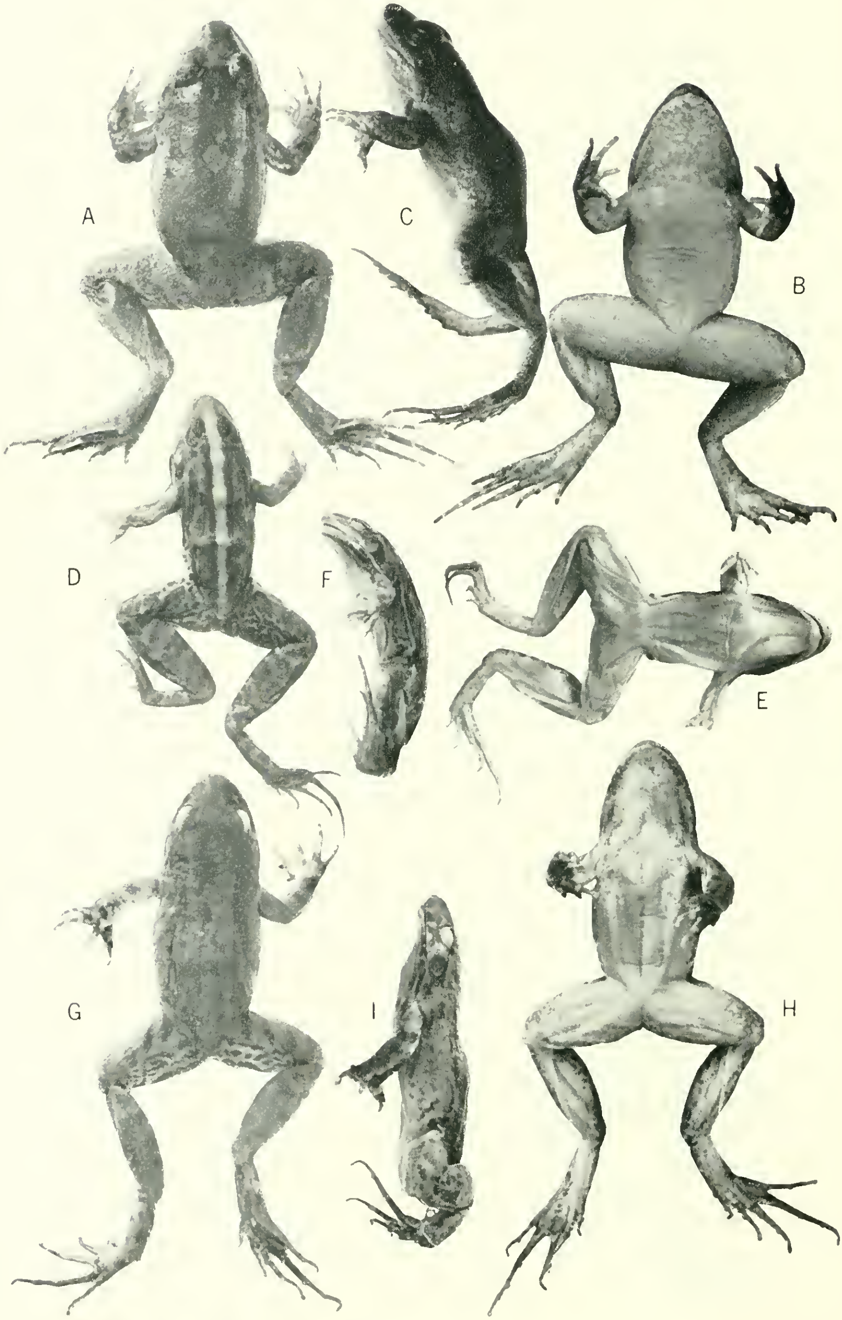

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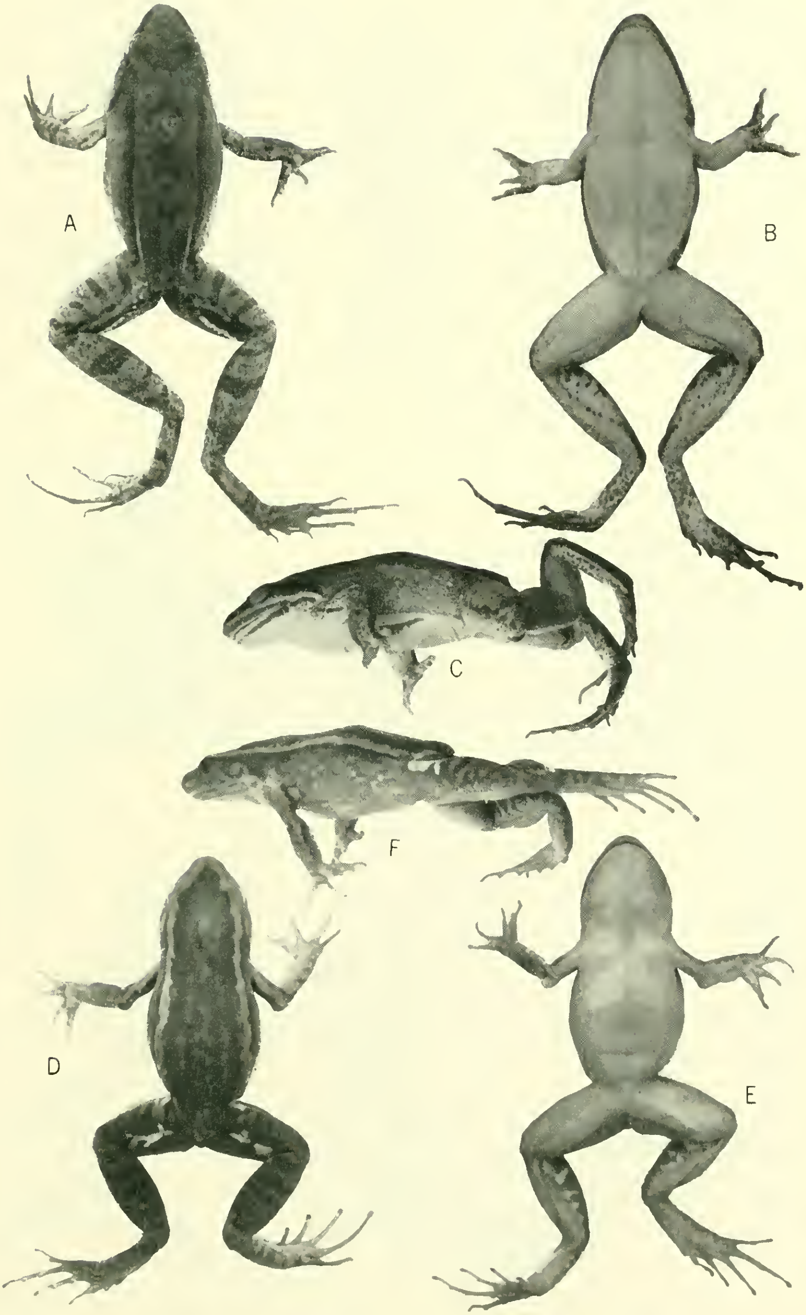

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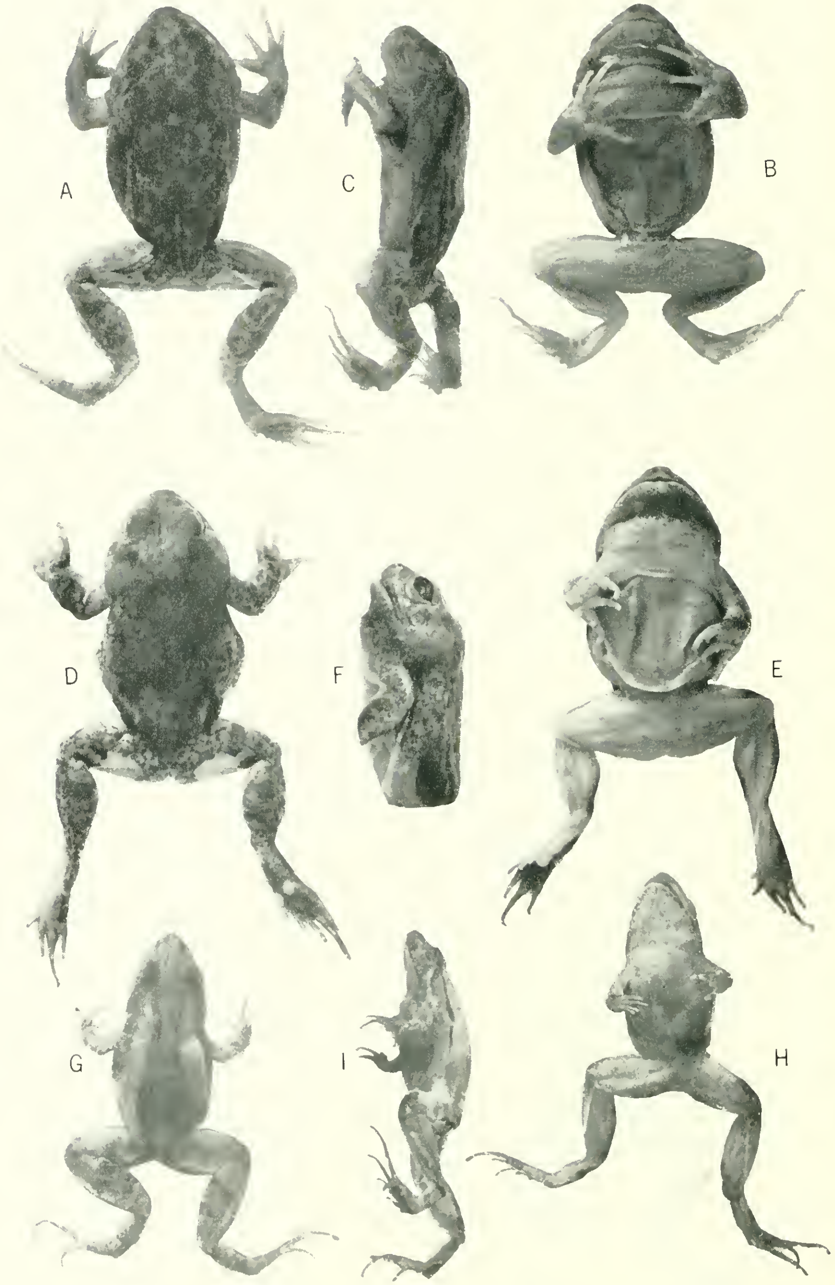

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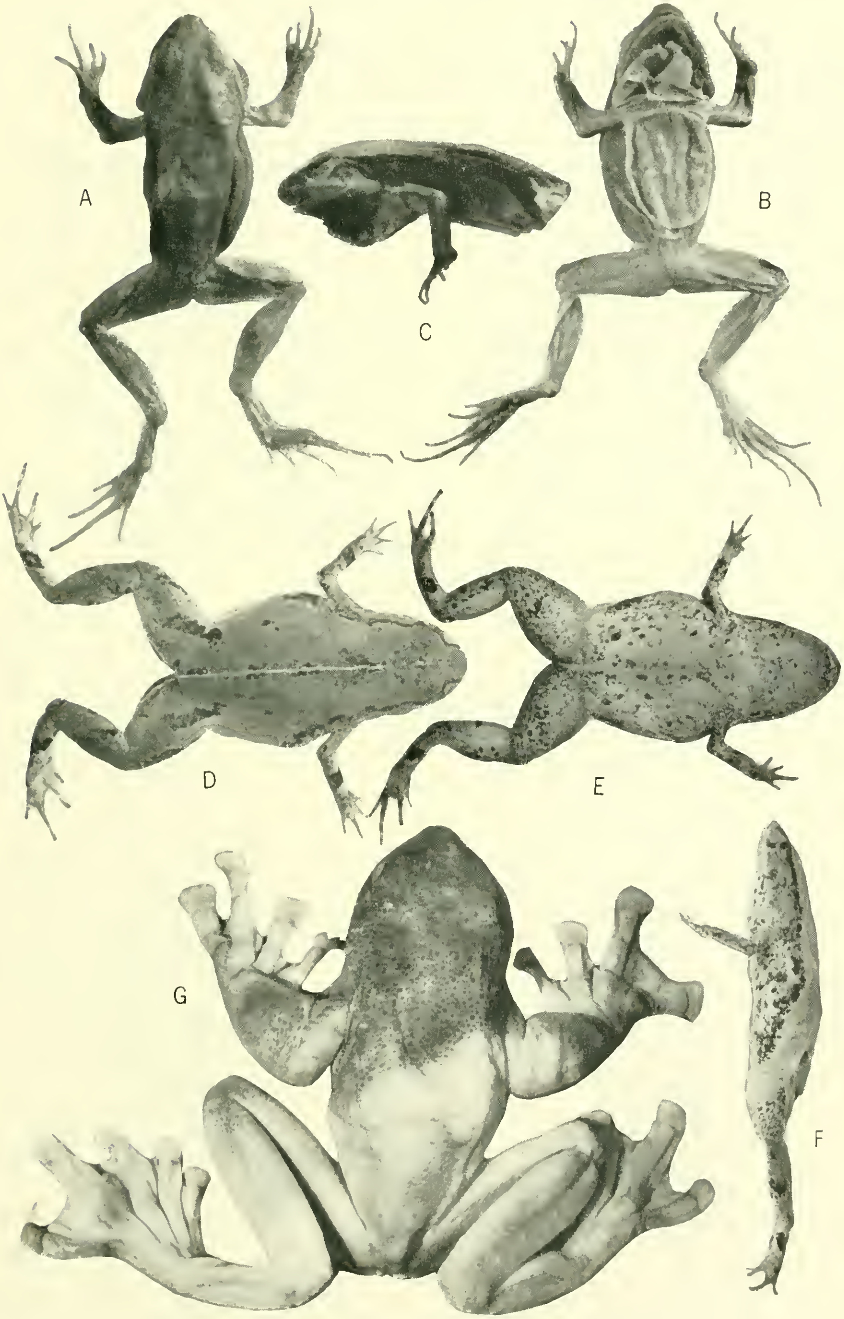

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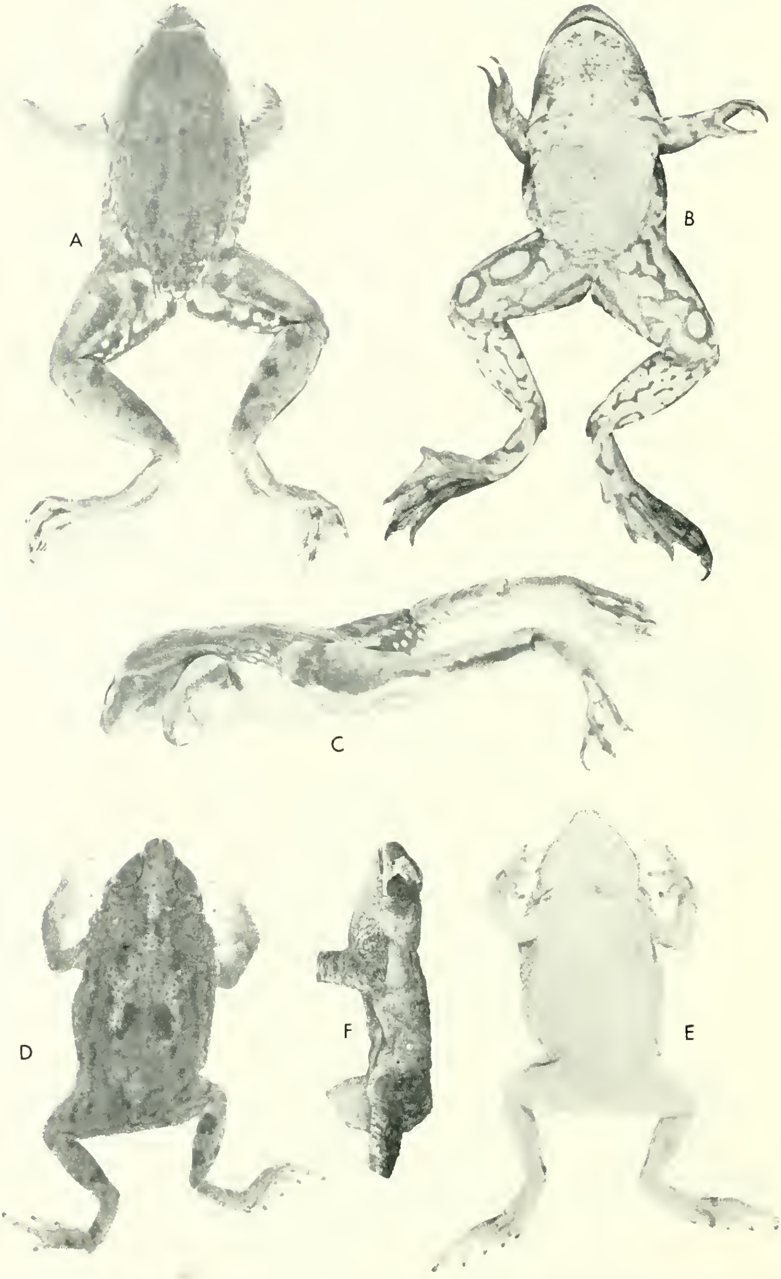

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